UNIONVILLE DRAINAGE STUDY

FINAL REPORT TO THE
WORCESTER COUNTY COMMISSION

DEC 1990

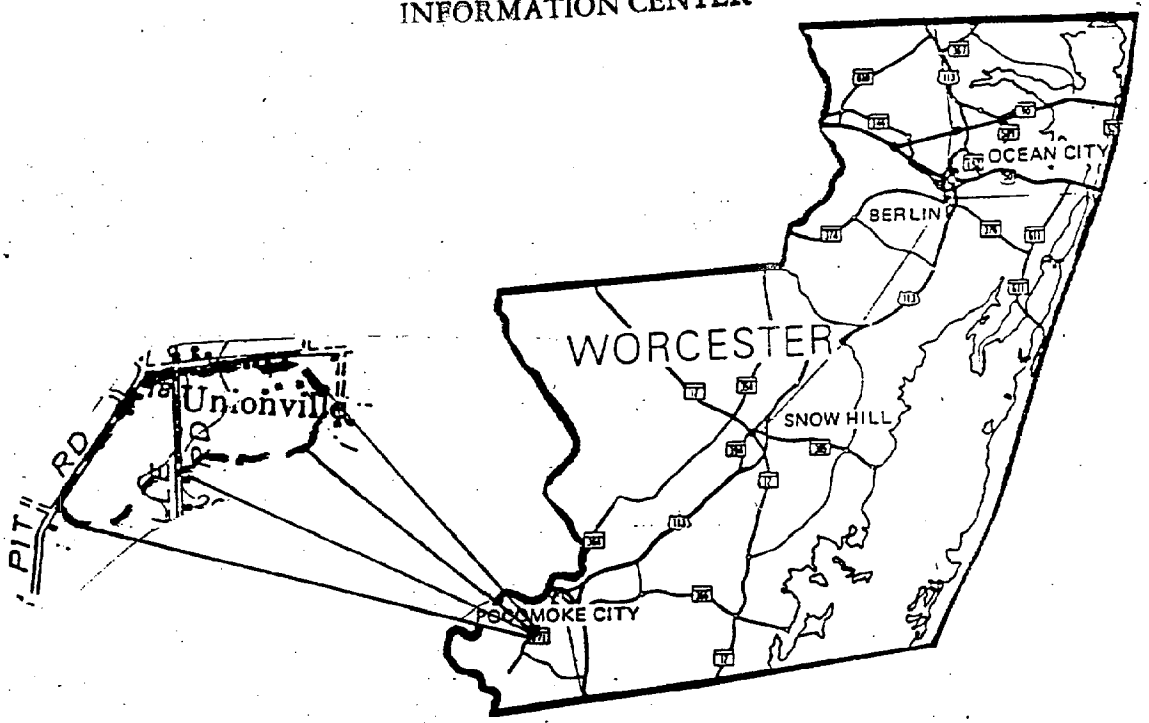
UNIONVILLE DRAINAGE STUDY

A FINAL REPORT TO THE

WORCESTER COUNTY COMMISSIONERS

COASTAL ZONE

INFORMATION CENTER



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December 4, 1990

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UNIONVILLE DRAINAGE STUDY

WORCESTER COUNTY, MARYLAND

SUMMARY

This study proposes a project for watershed protection, flood prevention and drainage in Worcester County Maryland to improve the living conditions of approximately 40 home sites and to improve the agricultural economy. The project includes approximately 10,283 linear feet of channel construction, two water control structures and one sediment basin. The project construction cost is estimated at $28,929.

Three alternatives were considered during the project study: 1) No action; 2) Channel improvement; and 3) Multiple purpose channel improvement. The multiple purpose channel improvement project was selected to insure minimum environmental disturbance.

The multiple purpose channel improvements could be installed by a Public Drainage or Watershed Association. The County Commissioners could organize such an association under the authorities granted by state law. The commissioners could provide financial and technical assistance to such an association according to established procedures. The final project scope should be approved by the association and commissioners.

The multiple purpose channel should be operated and maintained by the association organized by the commissioners. Land treatment measures should be operated and maintained by the owners and/or operators of the farms on which the measures are installed.

INTRODUCTION

PURPOSE OF STUDY

The purpose of this study is to evaluate the water and related land resources of the Unionville area,to identify problems associated with their use and development and to propose alternatives for the development of these resources. The overall intent of the study is to improve the quality of life and to manage, conserve, preserve, create, restore and improve the quality of natural and cultural resources and ecological systems.

AUTHORITY FOR STUDY

Worcester County Commissioners

FUNDING FOR STUDY

Preparation of this document was (partially) funded by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resources Management, National Oceanic and Atmospheric Administration.

NATURE OF STUDY

This study reviews water and related land resources to meet present and future needs of the area and presents suggested alternatives for achieving orderly and beneficial utilization, development and conservation of these resources. Specific evaluations were made for flooding, wetlands, land treatment, soil erosion and sedimentation, drainage, water quality and fish and wildlife.

DESCRIPTION OF THE DRAINAGE STUDY AREA

PHYSICAL DATA

The Unionville Drainage area comprises an area east of, and adjacent to, the Pocomoke River and just southwest of Pocomoke City, Maryland. It is in the Atlantic Coastal Plain physiographic province and is mantled with sediments of Pleistocene and recent geologic ages. The topography is quite flat and sea level elevations range from 4 feet to 20 feet. The existing drainage channels have an average gradient of .0017 feet per foot and stream flow is generally easterly in direction.

Total drainage area is 150 acres of which 63 acres are open land, 47 acres are woodland and 40 acres are homestead. The major crops are corn and soybeans.

Soils in the watershed are of coastal plain origin and about 65 percent are poorly drained. The soils are suitable for agriculture when well managed, drained and protected from flooding.

The normal growing season is 200 days and ranges from mid April to late October. Average annual temperature is about 58 degrees F. February has the lowest monthly average at 39 degrees F. and July has the highest at 78 degrees F.

Precipitation averages about 43 inches annually and is fairly evenly distributed through the year with a maximum in August and a minimum in October or February. Heavy rains during the colder half of the year are usually from low pressure systems moving north or northeasterly along the coast. In summer, heavy rains occur mostly in thunderstorms, tropical storms or hurricanes. Thunderstorms

occur on an average of 30 days a year with 77 percent of these from May to August. Tropical storms or hurricanes affect the area about once a year, usually between July and November. Many of these cause at least minor damage through heavy rainfall, strong winds and high tides.

The major water use is for domestic purposes and these requirements are satisfied by private wells.

The 47 acres of forest land are well suited for production of timber products and, with management, improvement of forest hydrologic conditions is expected.

ECONOMIC DATA

The drainage area is rural in character and is known as Unionville. The total population is estimated at about 150 people. This area is located about two miles southwest of Pocomoke City, Maryland.

There are six parcels being farmed in the drainage area. The remaining lands are woodland and lots ranging from .2 acres to 10 acres in size. The average lot size is about one acre. Most of the farmland is rented to outside interests. There are no poultry operations or livestock operations in the drainage area.

Present forest stands, which occupy about 31 percent of the area, consist of 60 percent softwood stands, mostly Loblolly Pine, 10 percent bottom land hardwoods and 30 percent mixed stands. Timber resources are a major economic consideration with sawtimber and pulpwood dominating the stand. Most of the residents are employed in Pocomoke City, Salisbury and Snow Hill.

FISH AND WILDLIFE RESOURCES

Wildlife resources in the study area are comprised of low to moderate populations of a diversity of species including game and nongame representations. Waterfowl use of the area is considered low to moderate. Hunting pressure for these species is moderate. The stands of mixed hardwood and pine located within the area constitute good forest wildlife habitat.

Fish resources in the study area are limited to small intermittent and ephemeral streams and a very small pond. Fish resources in the nearby Pocomoke River are excellent. Drainage ways in the study area are not documented as being utilized by anadromous fish for spawning purposes. However, anadromous fish, including the American eel, are known to have limited use.

SOILS

The most common soils in the watershed are members of the Fallsington, Pocomoke, Woodstown, Sassafras, Fort Mott, Klej, Lakeland, Portsmouth and Plummer Series. The poorly drained Fallsington, Plummer, Pocomoke and Portsmouth soils occur in wooded and lowland areas and in numerous pockets throughout the study area. These soils have high water tables part of the year and are severely limited for many uses.

The Woodstown, Sassafras, Fort Mott and Klej are moderately-well and well-drained soils. The water table in Woodstown soils are within two feet of the ground surface in winter and spring and create moderate limitations for farming and most nonagricultural uses. Sassafras, Fort Mott and Klej soils have lower water tables.

The Lakeland series consists of level to steep, deep, excessively drained, sandy soils on interfluvial flats and dunes (Appendix - Exhibit 2 - Soils).

Hydric Soils, (Appendix - Exhibit 3 - Hydric Soils) as identified by the Food Security Act of 1985, represent approximately 65 percent of the total area. Highly erodible soils represent 7 percent and prime farm land represents approximately 15 percent.

WETLANDS

Wetlands physical and legal interpretation is in a constant state of change. Presently, the Federal Manual for Identifying and Delineating Jurisdictional Wetlands is generally the chosen guide. This manual selects three criteria as necessary elements to be investigated in order for a site to be determined as a wetland. These criteria are hydric soils, hydrophytic vegetation and hydric conditions. In the appendix of this report, Exhibit 2 shows a map of the soils and their location and Exhibit 3 shows the hydric soils. All hydric soils have potential to be wetlands! The hydric condition has not been modified by man to the extent necessary not to be subject to wetland regulations in the woodland or cropland. Hydrophytic vegetation is present on all sites not considered disturbed by lot development, filling or presently being farmed. All soils shown as hydric that display hydric conditions and hydrophytic vegetation are considered wetlands. Cropland hydric soils are also considered wetlands due to their disturbed state and potential for reverting to sites dominated by hydrophytic vegetation. All wetlands will require permits for any activity as determined by current statutes.

Exhibit 4 shows wetlands which display the wettest conditions. This means they are generally considered wetlands of greater value due to the frequency and duration of flooding. Due to the many ecological values of these wetlands, which include: nutrient traps, nutrient reservoirs, aquifer recharge, amphibian and insect nursery and vegetative communities, they are emphasized in this report for protection and management to assure their values are enhanced and not degraded.

The wetlands shown are farmed wetland, open water, palustrine emergent, palustrine forested and drainage ways. These are the wetlands which we feel will be subjected to greater scrutiny for various permitted activities. Exhibit 5 (Non-tidal Soil and Wetlands Vegetation Notes) describes the soil condition and vegetation at the time of the investigation.

ENDANGERED AND THREATENED PLANTS AND ANIMALS

The bald eagle (Haliaeetus Leucocephalus) is included in the federal list of endangered species and is protected under The Endangered Species Act of 1973. Nesting of this species occurs immediately south of the study area adjacent to the Pocomoke River. This area is identified in the Delmarva River Basins Survey, October 1978, Wildlife Biologic Priority Areas, Pocomoke Sub-Basin, Appendix A. No other endangered or threatened species are known to inhabit or use the immediate watershed area. Contact has been made with the State Natural Heritage Foundation for further research.

CULTURAL RESOURCES

There is archaeological evidence of human occupation of the Delmarva Peninsula from about 10,000 B.C. onward. It is thought that early inhabitants of the area established transient or seasonal camps from which they ventured for hunting and

foraging. Prehistoric sites tend to be small in size and low in lithic (spear points, grinders and knives) density. Most are located on well drained soils with moderate slopes where relatively high elevations are adjacent to swamps or stream confluences. Other sites of historic and architectural significance are farm houses of the early nineteenth century.

It is evident from early history that archaeological and historical resources are significant. Should any of these resources be discovered from project activities, the recovery, protection or preservation operations will be handled in accordance with the Archaeological and Historical Preservation Act (PL 93-291).

DRAINAGE STUDY AREA PROBLEMS

LAND TREATMENT

The major land treatment problem is excess floodwater and inadequate drainage outlets. On-farm drainage has been installed on one farm. Lack of an adequate outlet, or the limited effectiveness of present outlets, has prevented the application of drainage on other areas. Due to wet field conditions limited acreage can be treated with cover crops. Poor drainage conditions on existing cropland limit management options and prevent farmers from meeting desired planting and harvesting schedules and periodically cause partial to total crop loss, severe weed problems, limited use of cover and green manure crops and shallow root development.

FLOODWATER

Crop losses from flooding are experienced periodically, sometimes occurring several times during a growing season. Road and culvert damage occur at points where they cross channels. Damage to homes occurs periodically in the form of flooded yards, muddy and impassable driveways and roads and malfunctioning septic systems. All of these contribute to reduced property values and increased health hazards.

EROSION SEDIMENT

Due to the flat topography, gully and sheet erosion are minor in the study area. Some slight wind erosion occurs seasonally on the few acres of well-drained soils in the study area. Although erosion and the accompanying sediment productions are slight, even small amounts of sediment are significant when they are deposited in farm ditches, outlet channels, culverts and pipes. Where sedimentation occurs, it complicates drainage and floodwater runoff by reducing transmission capacity of channels and structures.

DRAINAGE STUDY ELEMENTS

DRAINAGE STUDY RECOMMENDATION

This study recommends that approximately 10,283 linear feet of channel excavation be done and that a land treatment program be initiated through the local Soil Conservation District.

Efforts have been made to minimize the detrimental effects of channel work. Channel work has been planned to follow the alignment of existing channels whenever this is practical. Groups of trees which have significant aesthetic, scenic, or ecological value should be left standing within the construction limits where this is technically feasible, and where trees can be expected to survive in disturbed surroundings. At road crossings measures will be taken to make channels more visually pleasing. Where possible a vegetative screen of trees and shrubs should be preserved (or established) to create visual diversity.

A permanent sediment trap should be installed at the start of construction in the main channel. Sediment traps provide an area where some fines and heavier materials (such as sand and gravel), carried downstream during construction, can settle out before reaching the Pocomoke River. These traps will be cleaned out as necessary during construction and maintained to provide storage for future sediment deposits and for fish and wildlife habitat.

Channel sides should be fertilized and seeded upon completion of each day's excavation work. Berms should be limed, fertilized and seeded after excavation has been completed and the spoil has been spread and shaped. Channel site conditions will determine the construction method specified, the width of the

cleared area and how the spoil material is to be spread. Channel construction technique is divided into two categories: 1) construction through forest land and (2) construction through cropland.

CONSTRUCTION THROUGH FOREST LAND

Where channels pass through woods the width of the cleared areas will be kept to a minimum. Four options are available for channel construction in wooded areas: (1) clearing and shaping; (2) one-sided construction; (3) off-sided construction; and (4) two-sided construction. These methods differ from one another on the basis of the relative amounts of clearing and excavation permitted. Selection of a particular method is dependent upon the significance of existing fish and wildlife habitat, the condition of the present channel, and requirements for the new channel.

The off-side construction is the recommended option. Channel construction operations are performed from one side, within a 35 foot strip (Figure 1). However, in order to reduce blowdown problems, trees and other vegetation on the off-side bank are removed within 12 feet of the top of the constructed side slope of the channel.

The channel bottom is deepened and widened as necessary, and both channel sides are cut to provide 1:1 side slopes. Although most of the spoil material is deposited and spread on the construction side, some is also spread on the off-side to form a low berm. The berm retards overbank flow and provides a suitable surface for seeding. Control inlet pipes are installed on both sides of the channel at appropriate intervals and both banks are seeded to grass. Maintenance mowing is not performed on the off-side bank so that over a period of years a new

stand of trees will become established along the channel. This option will also facilitate construction where the center line of the drainage ditch is the property line.

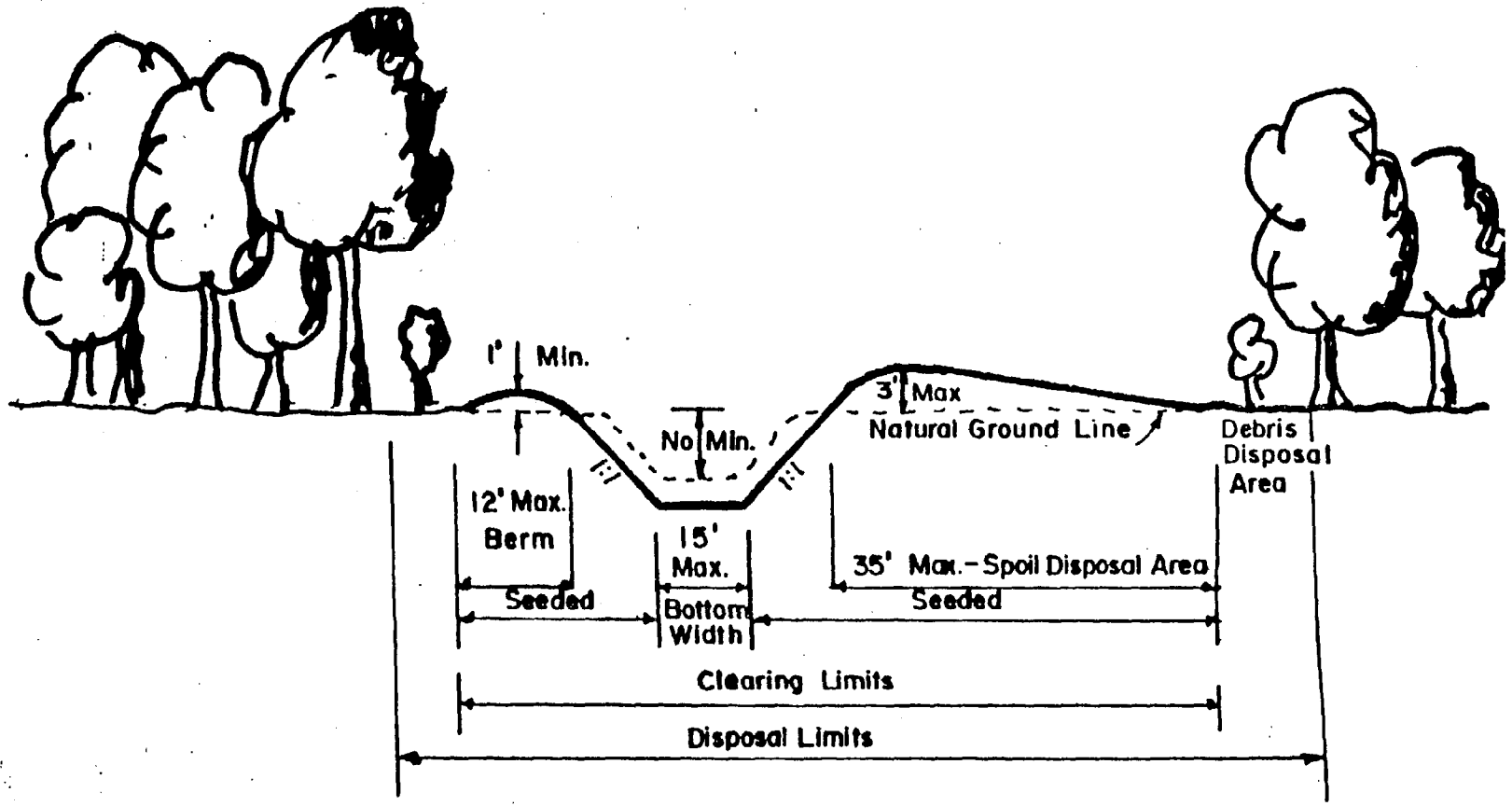


Figure 1. Off-sided channel construction through woods

CONSTRUCTION THROUGH CROPLAND

Channel construction through cropland may involve clearing and shaping, one-sided, off-sided, or two-sided construction methods, depending on the location of existing fish and wildlife habitat, the condition of the present channel and requirements for the new channel.

The one-sided construction method (Figure 2) or two-sided construction (Figure 3) are the recommended options.

One-sided construction through cropland can be performed where: 1) the existing channel is at least 3 feet deep with stable side slopes and very few overhanging or leaning trees; 2) the bottom width of the channel after construction will be 15 feet or less; and 3) insurmountable property line problems do not exist.

Construction work will be performed from the less vegetated bank. In situations where hedgerows occupy both banks and where property lines are involved vegetation should be removed from both sides.

One-sided construction through cropland differs slightly from the same method used through woods. Spoil obtained from channel excavation is spread into cropland, usually to a depth of about six inches, to minimize interference with normal farming operations. A flat, ten foot berm (instead of a reverse berm) is provided as a buffer between cropland and the channel to control erosion. This berm is seeded to grass and is mowed at appropriate intervals to control woody vegetation.

Two-sided construction will be performed from both sides or either side, as necessary, where insurmountable property line problems exist. When two-sided construction is performed through cropland, spoil is deposited on either or both sides of the channel and spread to minimize interference with normal farming operations (Figure 6). Grass filter strips, ten feet wide, are established and maintained along both banks. Seeding will be carried out in the constructed areas.

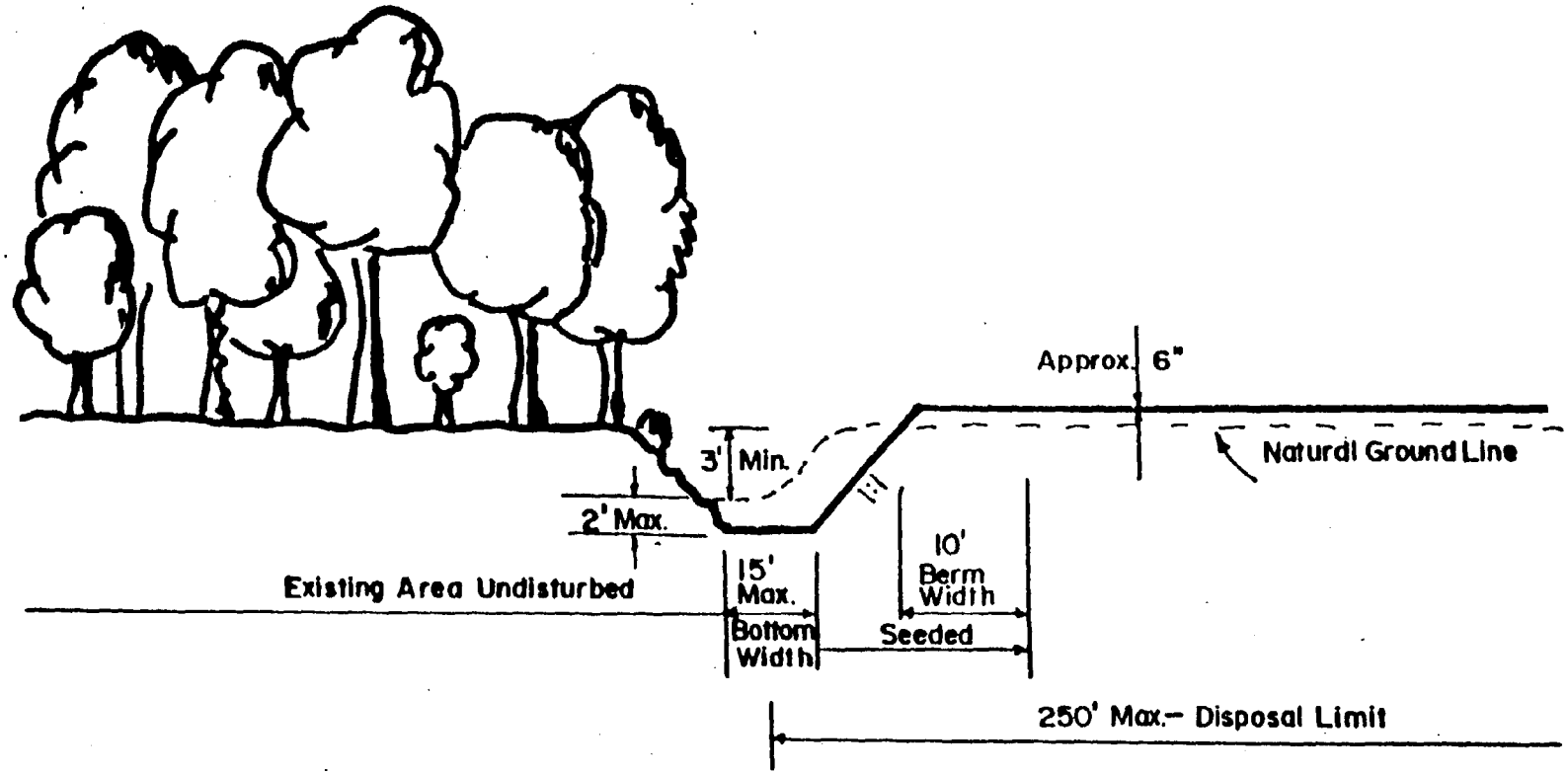


Figure 2. One-sided channel construction-- woods and cropland

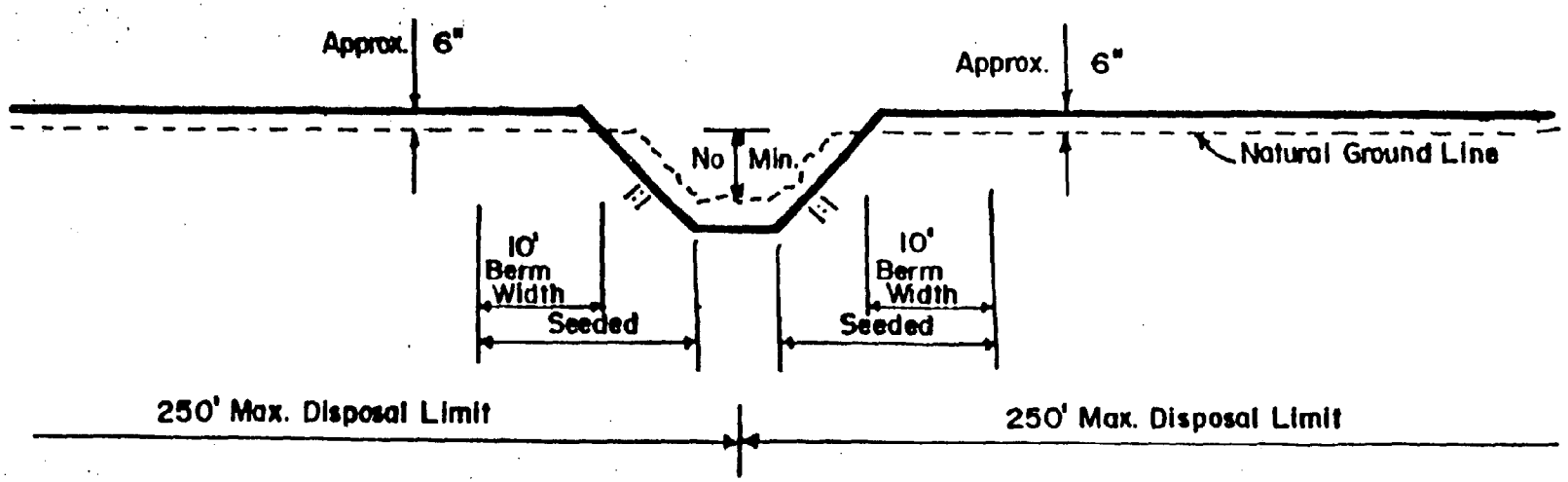


Figure 3. Two-sided channel construction -- through cropland

LAND TREATMENT

Use the local Soil Conservation District to assist landowners and operators with the installation of on-farm drainage systems, tile drainage, land smoothing, hedgerow planting, wildlife wetland habitat management and forest land management practice.

MITIGATION FEATURES

Water control structures are planned on the main channel at Station 13+65 and Station 44+32. With adequate rainfall and proper operation, the structure at Station 13+65 on the Main will maintain water in the channel for approximately 2,250 feet and 905 feet of Prong 1. The structure at Station 44+32 on Main will maintain water in the channel for approximately 1,650 feet and 1,430 feet on Prong 2. These structures will help maintain water table levels during dry seasons and have favorable affect for wildlife. The sediment trap at the beginning of construction will also provide for wildlife habitat.

PERMITS REQUIRED

Permits will have to be acquired for construction, operation and maintenance through the Maryland Department of Agriculture, which is the lead agency for all other Maryland agencies who may be interested in the project. Permits or notifications are required to change course, current or cross-section of a nontidal stream. Permits or notifications may be required under Section 404 of the Clean Water Act. The U.S. Army Corps of Engineers determines need on a case-by-case basis. Other state and federal agencies may require review or permits, therefore, it is suggested that the local office of the Soil Conservation District be contacted to determine these needs.

COST

The study area, as originally defined, involved three separate hydrologic units (Area I, Area II, and Area III) each having their own outlet. A cost analysis was computed for each unit having severe drainage problems.

Alternative	Name	Cost
1	No Action	$ 0.00 *
2	Channel Improvement	
	Area I	
	a. Excavation and Disposal	11,524.00
	b. Clearing	6,900.00
	c. Seeding	3,400.00
	Total Estimated Cost	$ 21,824.00
	Area II	
	a. Excavation and Disposal	150.00
	b. Clearing	156.00
	c. Seeding	90.00
	Total Estimated Cost	$ 396.00
	Area III	
	a. Excavation and Disposal	2,210.00
	b. Clearing	984.00
	c. Seeding	615.00
	Total Estimated Cost	$ 3,809.00

* The no action alternative has high cost to existing land uses. These costs include: road failure; septic tank failure; increasing advancement of saturated or flooded conditions and associated crop loss; and the inability to maintain roads and homes including degeneration of foundation stability.

Alternative	Name	Cost
3	Multiple-Purpose Channels	
	Area I	
	a. Excavation and Disposal	11,524.00
	b. Clearing	6,900.00
	c. Seeding	3,400.00
	d. Water Control Structures	2,900.00
	Total Estimated Cost	$ 24,724.00
	Area II	
	a. Excavation and Disposal	$ 150.00
	b. Clearing	156.00
	c. Seeding	90.00
	Total Estimated Cost	$ 396.00
	Area III	
	a. Excavation and Disposal	2,210.00
	b. Clearing	984.00
	c. Seeding	615.00
	Total Estimated Cost	$ 3,809.00

Cost does not include administrative costs, engineering services and pipe modifications either public or private.

FUNDING AND TECHNICAL ASSISTANCE RESOURCES

Under Maryland law, Public Drainage or Watershed Association could tax beneficiaries for the cost of installation and operation and maintenance.

The local County Commissioners could contribute to the cost of construction.

The Farmers Home Administration could make financial assistance available to eligible landowners under the provisions of the Soil and Water Conservation Loan Program.

Various state agencies have programs that may apply to this project. Below is a listing of possible participating agencies.

1. Maryland Department of the Environment
2. Maryland Department of Natural Resources
3. Maryland Department of Agriculture
4. Maryland Department of Housing and Community Development

The Soil Conservation Service will provide technical assistance in the preparation and application of conservation farm plans. Such assistance will be provided through the on-going program of the district and will be accelerated as needed to meet the project schedule.

The Forest Park and Wildlife Service through the Maryland Department of Natural Resources is available to provide services to district cooperators with technical forestry assistance in the project area for the preparation and carrying out of management plans.

The county Agricultural Stabilization and Conservation Committee could provide cost-sharing assistance to farmers of the watershed in accordance with the provisions of the program in effect at the time assistance is requested.

State fish and game agencies and the U.S. Fish and Wildlife Service could provide technical assistance under on-going programs for the improvement of fish and wildlife habitat on the farms in the watershed. Special emphasis will be given to the use of adapted seeds and plants on spoil banks, berms of field ditches and sediment traps and to the treatment of odd areas created by realignment of drainage systems.

LAND RIGHTS

If a Public Drainage or Watershed Association is formed then land rights would be obtained under state law organizing the association.

County road culverts improvements would be considered land rights and be the responsibility of the association to resolve. Private channel crossings could be considered private convenience crossings and be the responsibility of the landowner or become the responsibility of the association if formed. The two water control structures would be the association's responsibility.

The association should give consideration to establishing a permanent maintenance easement so that any type of structure could not be built that would obstruct future maintenance operation. This maintenance easement should be 50 feet from the top of the bank on each side.

RELOCATIONS

No relocations are anticipated. Should the need for relocations arise, they will be accomplished by the association.

OPERATION AND MAINTENANCE

After construction the channels and structure should be operated and maintained by the local people. If a Public Drainage or Watershed Association is the selected means to complete the project then funds could be acquired through taxation of the benefited landowners.

The estimated annual cost of operation and maintenance is $500.00. Typical maintenance activities are: mowing; brush control; stabilizing; fertilizing and reseeding critical areas; sand bar removal; debris removal; structure maintenance;

and maintenance of vegetated filter strips along the channels in both cropland and forest land. Presently, legal organized systems are eligible for maintenance cost share up to 50 percent of cost of maintenance from the Maryland Department of Agriculture.

When requested the local Soil Conservation District could participate in the maintenance program to the extent of furnishing the following: technical assistance to aid in inspection; technical design information necessary for maintenance program; and technical assistance to aid in the development and revision of operation and maintenance programs.

ENGINEERING

Surveys for the multiple-purpose channels consisted of a third order bench level net, horizontal control channels and valley cross-sections and spot elevations to determine hydraulic gradients. Datum used was based on sea level elevations.

Property lines were obtained from the Worcester County Tax Assessment Office (Appendix - Exhibit 6). Using the state wetlands map, the critical area line was drawn on the aerial photo (Appendix - Exhibit 1). Channel alignment was established based on property lines, natural flow, soils, elevations, and in locations with minimal impact on the environment.

Water surface profiles were computed on the two year and 100 year storm events to establish the starting point of construction. The hydraulic gradient was set by profiles and control elevations. A minimum freeboard of one foot was used in this design. The discharges were computed by the formula $Q = CM^{5/6}$, C is based on the runoff for various soil types and cover, M is the drainage area in square miles. This project was designed on the two year storm event which is 3.6 inches in 24 hours. All channels and culverts were designed using Manning's Formula.

All quantities were computed by the Soil Conservation Service method using field observations for various calculations. Unit cost is based on current prices.

Two water control structures were designed to store water on the main channel. Structure No. 1 is located at Station 13+65 and will back water upstream 2,250 linear feet with an average depth of three feet. Structure No. 2 is located at

Station 44+32 and will back water 1,650 linear feet on the main and 1,430 linear feet on prong No. 2 with an average depth of 2.2 feet. These structures can be used in times of droughts and during noncrop seasons to restore wetland conditions.

A sediment pond was designed at Station 10+00 to 10+64 on the main. The pond was designed three feet below channel design grade and will store annual contributions up to 1.8 tons of sediment per acre of drainage area. The total storage capacity is 5,360 cubic feet.

GEOLOGIC INVESTIGATIONS

There were 22 test holes (Appendix - Exhibit 5) put down by hand auger at various locations for channel stability and hydric soil determinations. The unified soil classification system was used to determine their engineering properties. The soils were predominately sand (about 80 percent). Some silts and clays were found. The following criteria was used in the classification:

SP	Sand, Poorly graded	0- 5% Fines
SM	Sandy-Silt	5-25% Fines
SC	Sandy-Clay	25-50% Fines
ML	Silt with low plasticity	
CL	Clay with low plasticity	

Soil investigations indicate no problems in channel stabilization.

ACKNOWLEDGEMENTS

U.S. Department of Agriculture, Soil Conservation Service

Worcester County Drainage Committee

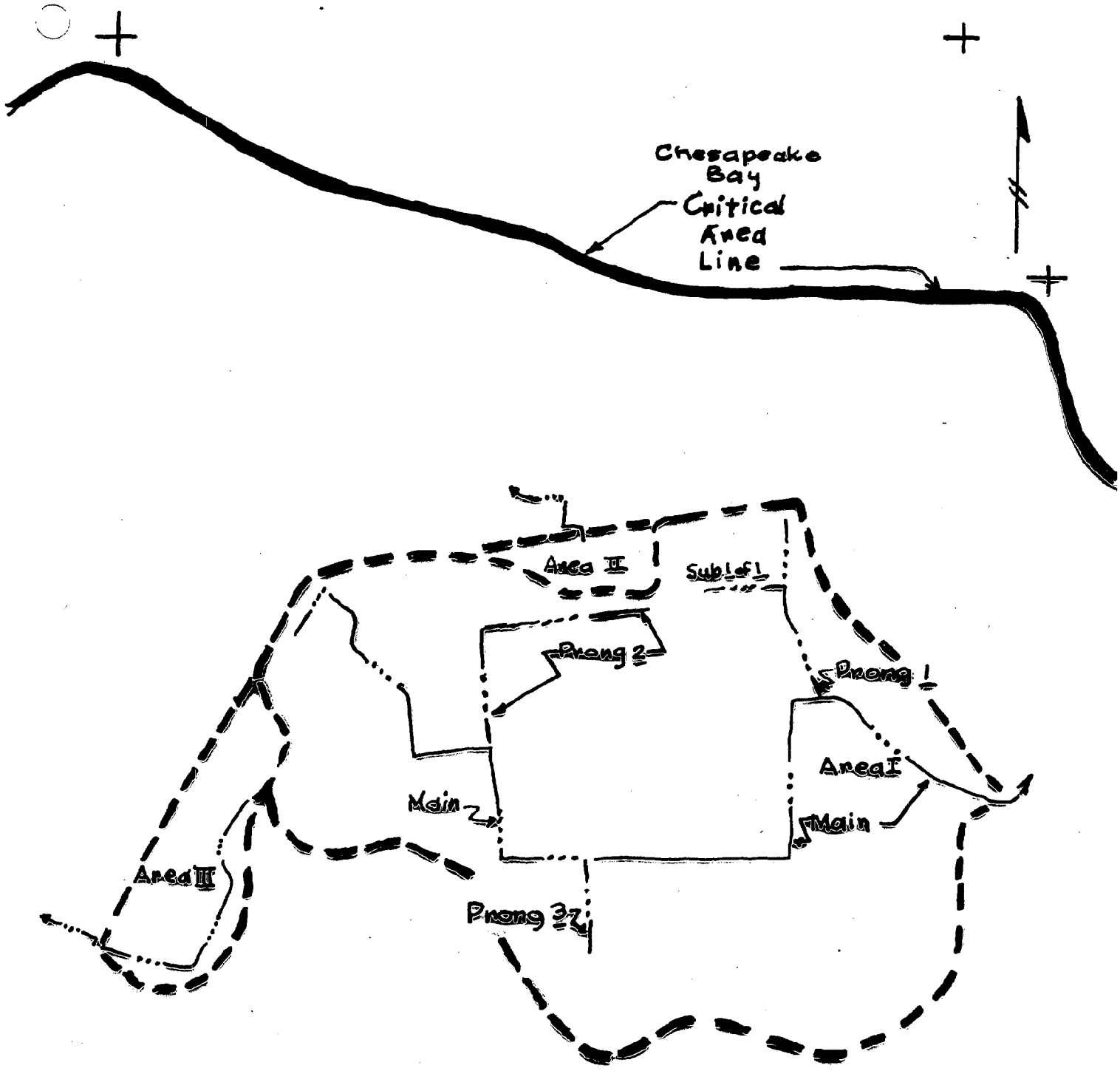
Maryland Department of Agriculture, Snow Hill Office

Worcester Soil Conservation District

APPENDIX

EXHIBIT 1

WATERSHED BOUNDARY AND CHESAPEAKE BAY CRITICAL AREA LINE



Legend

Critical Area

Watershed Boundary

Drainage Channels

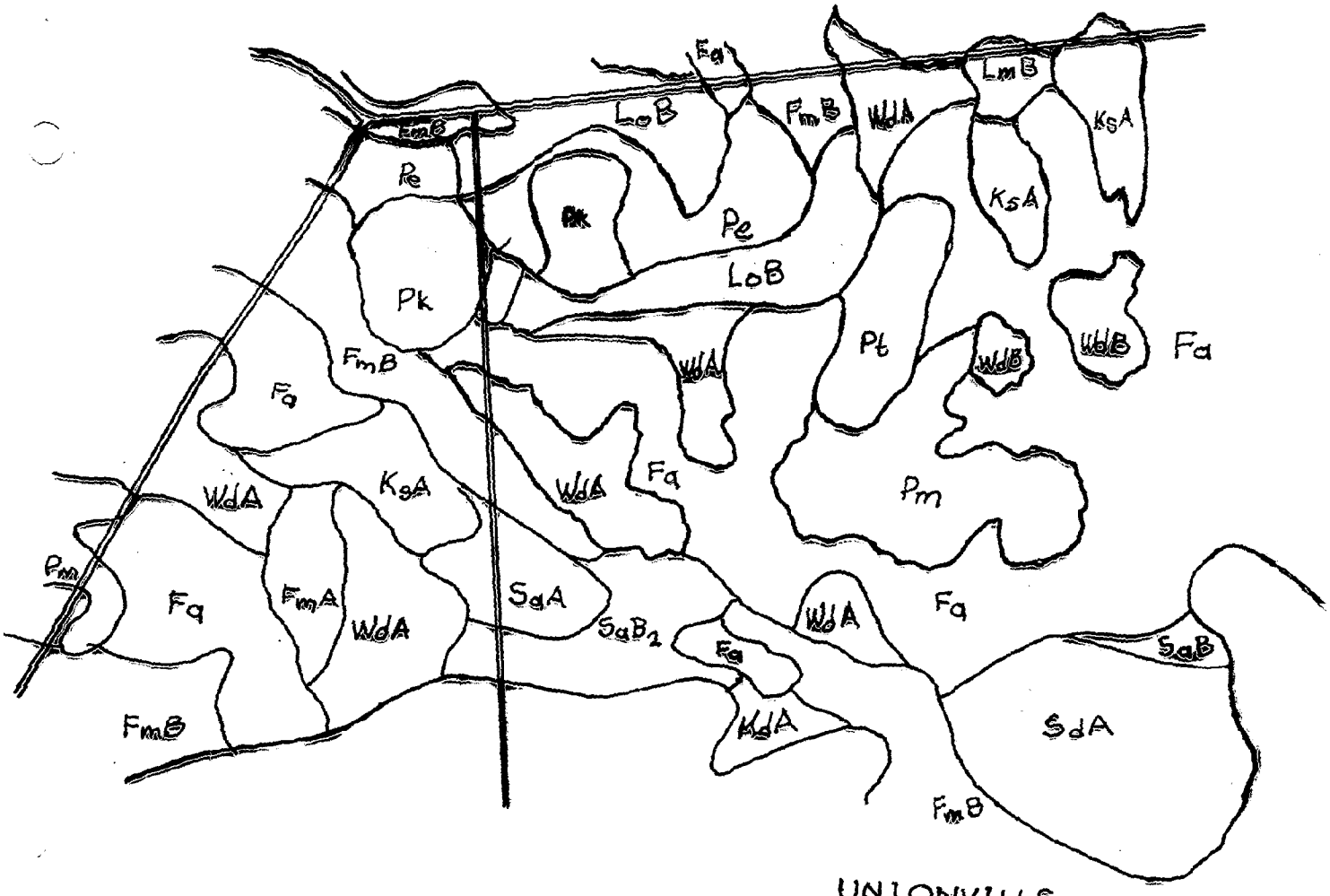
UNIONVILLE
Scale: 1" = 660'

Exhibit 1

EXHIBIT 2

SOIL

Soil Survey
Worcester County, Maryland



UNIONVILLE
Scale: 1" = 660'

Exhibit 2

UNIONVILLE SOILS

SOILS SYMBOL	SOIL NAME	HYDROLOGIC SOIL GROUP
Fa	Fallsington Sandy Loam	D
Fg	Fallsington Loam	D
FmA	Fort Mott Loamy Sand, 0 to 2% slopes	B
FmB	Fort Mott Loamy Sand, 2 to 5% slopes	B
KsA	Klej Loamy Sand, 0 to 2% slopes	B
LmB	Lakeland Loamy Sand	A
LoB	Lakeland - Fort Mott Loamy Sand, 2 to 5% slopes	A
LoC	Lakeland - Fort Mott Loamy Sand, 5 to 10% slopes	A
MpA	Mattapex Loam, 0 to 2% slopes	C
Pe	Plummer Loamy Sand	D
Pk	Pocomoke Sandy Loam	D
Pm	Pocomoke Loam	D
Pt	Portsmouth Silt Loam	D
SaA	Sassafras Sandy Loam, 0 to 2% slopes	B
SaB2	Sassafras Sandy Loam, 2 to 5% slopes	B
WdA	Woodstown Sandy Loam, 0 to 2% slopes	C
WdB	Woodstown Sandy Loam, 2 to 5% slopes	C

HYDROLOGIC SOIL GROUPS

INTRODUCTION

Each soil is placed into one of four groups according to the rate of surface infiltration of water when the entire soil is thoroughly wetted. Infiltration under thoroughly wetted conditions is correlated positively with internal transmission of water, and thus negatively with runoff potential. Infiltration and transmission of water is not the same as permeability. For instance, a rapidly permeable soil, such as Plummer, will have a very slow infiltration and transmission rate when thoroughly wetted because of a stagnant water table. Descriptions of the different hydrologic soil groups are as follows:

Group A --- Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravels. These soils have a high rate of water transmission and would result in a low runoff potential.

Group B --- Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately-well to well-drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission and a moderate runoff potential.

Group C --- Soils having a slow infiltration rate when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission and a high runoff potential.

Group D --- Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clay soils with a high swelling potential, (2) soils with a high permanent water table, (3) soils with claypan or clay layer near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission and a very high runoff potential.

EXHIBIT 3

HYDRIC SOILS

Soil Survey
Worcester County, Maryland

Hydric Soils

UNIONVILLE
Scale: 1" = 660'
Exhibit 3

UNIONVILLE SOILS

AREA I

HYDRIC SOILS	SOIL NAME	ACRES
Fa	Fallsington Sandy Loam	50.8
Fg	Fallsington Loam	1.2
Pe	Plummer Loamy Sand	9.2
Pk	Pocomoke Sandy Loam	8.4
Pm	Pocomoke Loam	10.8
Pt	Portsmouth Silt Loam	4.8

SOILS WITH HYDRIC INCLUSIONS	SOIL NAME	ACRES
KsA	Klej Loamy Sand, 0 to 2% slopes	2.4
WdA	Woodstown Sandy Loam, 0 to 2% slopes	13.2
WdB	Woodstown Sandy Loam, 2 to 5% slopes	3.6

HIGHLY ERODIBLE SOILS	SOIL NAME	ACRES
FmB	Fort Mott Loamy Sand, 2 to 5% slopes	9.2
LoC	Lakeland - Fort Mott Loamy Sand, 5 to 10% slopes	0.8

PRIME FARM LAND	SOIL NAME	ACRES
SaA	Sassafras Sandy Loam, 0 to 2% slopes	1.2
SaB2	Sassafras Sandy Loam, 2 to 5% slopes	5.2
WdA	Woodstown Sandy Loam, 0 to 2% slopes	13.2
WdB	Woodstown Sandy Loam, 2 to 5% slopes	3.6

OTHER	SOIL NAME	ACRES
LoB	Lakeland - Fort Mott Loamy Sand, 2 to 5% slopes	13.2

UNIONVILLE SOILS

AREA II

SOILS SYMBOL	SOIL NAME	HYDROLOGIC SOIL GROUP
Pe	Plummer Loamy Sand	D
Fa	Fallsington Sandy Loam	D
LoB	Lakeland - Fort Mott Loamy Sand, 2 to 5% slopes	A
FmB	Fort Mott Loamy Sand, 2 to 5% slopes	B

HYDRIC SOILS	SOIL NAME	ACRES
Pe	Plummer Loamy Sand	1.2
Fa	Fallsington Sandy Loam	0.4

HIGHLY ERODIBLE SOIL	SOIL NAME	ACRES
FmB	Fort Mott Loamy Sand, 2 to 5% slopes	0.4

OTHER	SOIL NAME	ACRES
LoB	Lakeland - Fort Mott Loamy Sand, 2 to 5% slopes	2.0

UNIONVILLE SOILS

AREA III

SOILS SYMBOL	SOIL NAME	HYDROLOGIC SOIL GROUP
FmB	Fort Mott Loamy Sand, 2 to 5% slopes	B
Fa	Fallsington Sandy Loam	D
WdA	Woodstown Sandy Loam, 0 to 2% slopes	C
Pm	Pocomoke Loam	D

HYDRIC SOILS	SOIL NAME	ACRES
Fa	Fallsington Sandy Loam	9.6
Pm	Pocomoke Loam	0.2

SOILS WITH POSSIBLE INCLUSIONS	SOIL NAME	ACRES
WdA	Woodstown Sandy Loam, 0 to 2% slopes	1.2

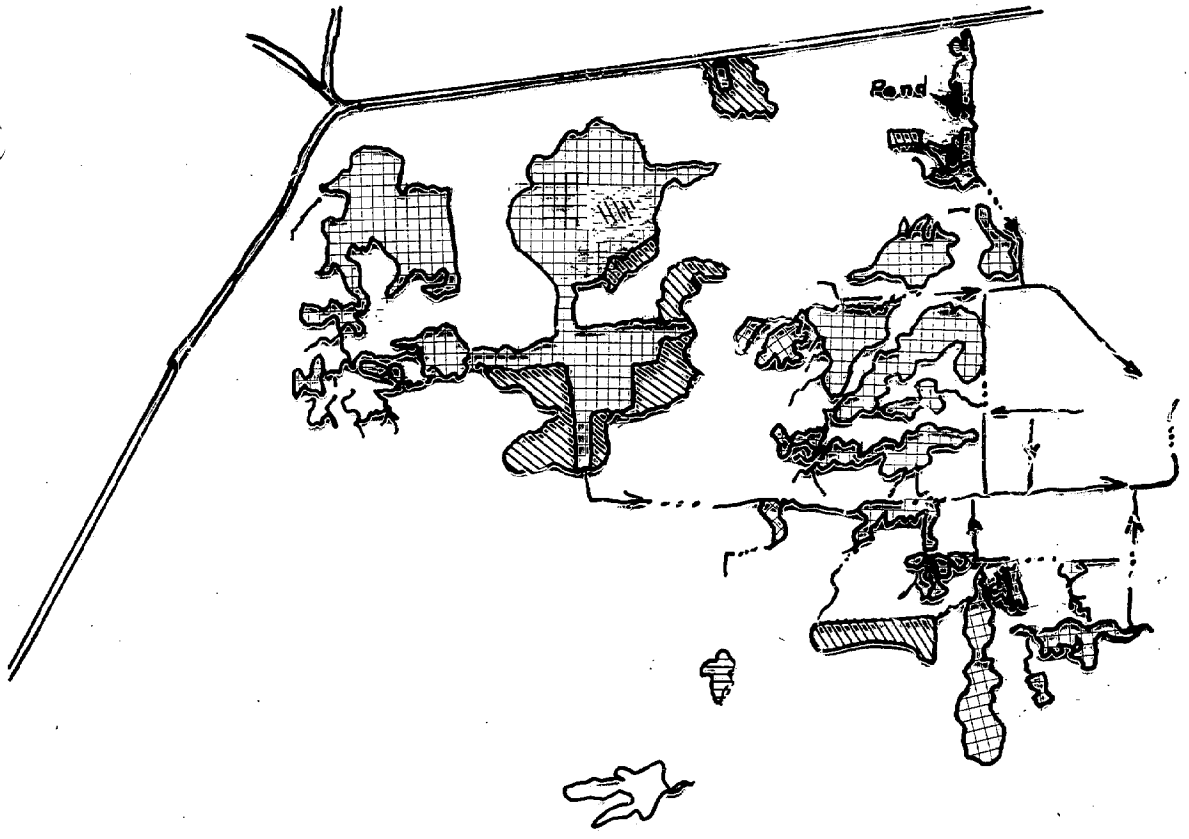
HIGHLY ERODIBLE SOIL	SOIL NAME	ACRES
FmB	Fort Mott Loamy Sand, 0 to 2% slopes	1.0

PRIME FARM LAND	SOIL NAME	ACRES
WdA	Woodstown Sandy Loam, 0 to 2% slopes	1.2

EXHIBIT 4

NONTIDAL WETLANDS

WETLANDS



Legend

- Farmed Wetlands
- Water - Pond
- Palustrine Emergent
- Palustrine Forested
- Drainage Ways

UNIONVILLE
Scale: 1" = 660'

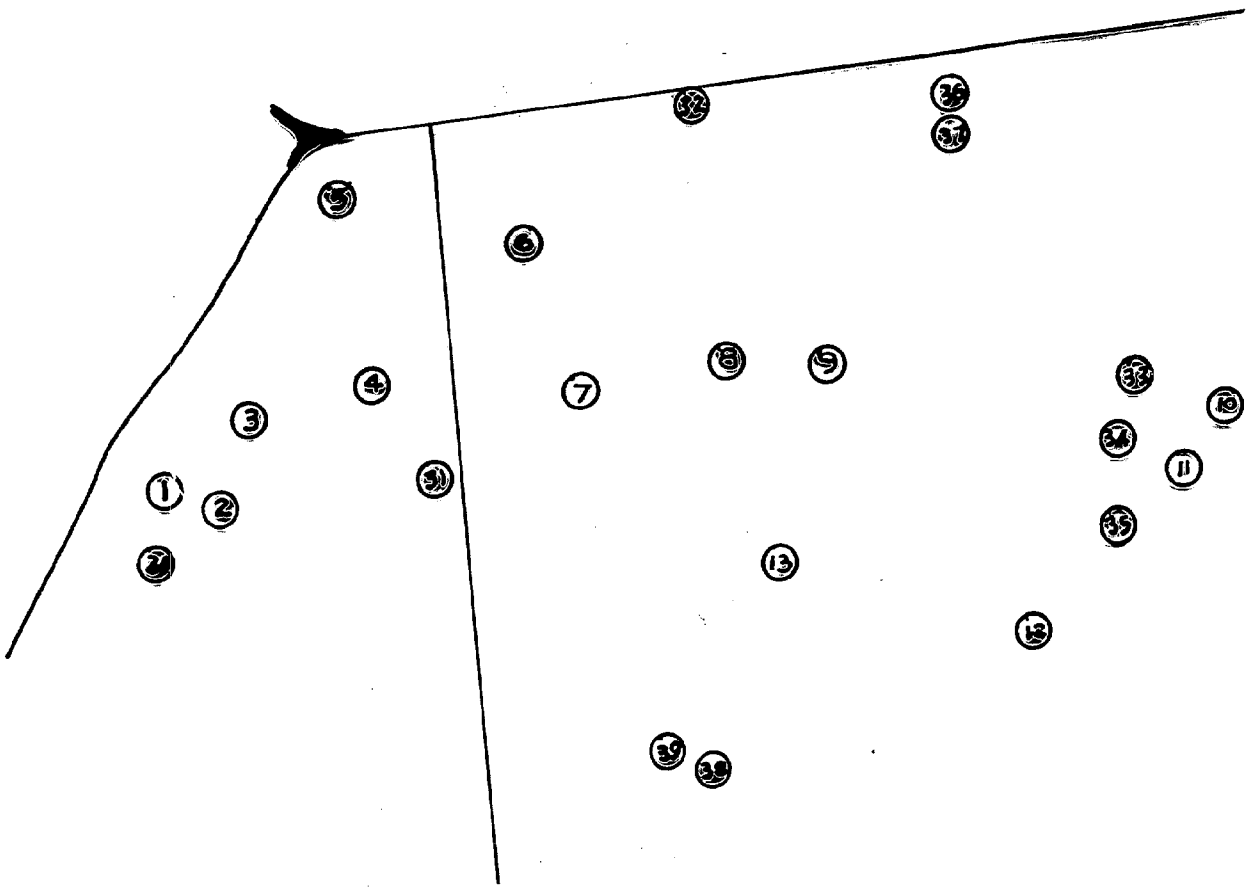
Exhibit 4


40

EXHIBIT 5

NONTIDAL SOIL AND WETLANDS INVESTIGATION

Non-tidal Soil and Wetlands Investigation Notes



Legend

③ Augar Hole

UNIONVILLE
Scale: 1"=660'

Exhibit 5


42

NONTIDAL SOIL AND WETLANDS VEGETATION
INVESTIGATION NOTES

August 3, 1990

SOIL AUGER HOLE NUMBER	DESCRIPTION			
1	0.0 FT. - 2.0 FT.	Grayish Brown Sand	20% Fines	SM
	2.0 FT. - 3.5 FT.	Grayish Sand	10-15% Fines	SM
		Water at 3.5 FT.		
	Vegetation:	Sedges		
		Bullrushe		
		Burgrass		
		Sweet Pepper Bush		
	Woods:	Sweet Gum		
		Scattered Loblolly Pine		
		Heath/Blueberry		
		Swamp Azalea		
2	0.0 Ft. - 1.3 FT.	Grayish Brown Sand	10-20% Fines	SM
	1.3 FT. - 2.0 FT.	Grayish Fine Sand	20-25% Fines	SM
		Mottling at 1.3 FT.		
	Vegetation:	Upper Canopy		
		a) 85% Loblolly Pine		
		15% Red Maple		
		Sub-Canopy		
		b) Blueberry, Heath, Holy		
3	0.0 FT. - 1.0 FT.	Black, Silt, Fine Sand		ML
	1.0 FT. - 1.5 FT.	Gray Sand	20% Fines	
		Mottling at 1.5 FT.		
		Water at 2.3 FT.		
	Vegetation:	Upper Canopy		
		a) 50% Sweet Gum		
		40% Maple		
		10% Loblolly Pine		
		Sub-Canopy		
		a) Cinnamon Fern & Green Briar		
		Open forest floor (flooded at times)		
		Ink Berry - Spagnum		
4	0.0 FT. - 1.5 FT.	Grayish Brown Sand	15% Fines	
	1.5 FT. - 2.5 FT.	Yellowish Brown Sand	15% Fines	
	2.5 FT. -	Yellowish Brown Sand	5% Fines	SP
		Well-Drained Soil		
	Vegetation:	Upper Canopy		
		a) 80% Loblolly Pine		
		20% Sweet Gum		
		Sub-Canopy		
		a) Dogwood		
		Wild Cherry		

SOIL AUGER HOLE NUMBER	DESCRIPTION			
5	0.0 FT. - 1.0 FT.	Grayish Brown Sand	15% Fines	
	1.0 FT. -	Mottling at 1.0 FT. Water at 2.0 FT. 50-50 Inclusion		
	Vegetation:	Upper Canopy a) 50% Water Oak 20% Loblolly Pine 10% Sweet Gum 10% Red Maple Sub-Canopy a) Devoid of Vegetation (Surface Flooding)		
6	0.0 FT. - 1.5 FT.	Grayish Brown Sand Mottling at 0.7 FT.	25% Fines	SM
	1.5 FT. -	Grayish Sand	35% Fines	SC
	Vegetation:	Upper Canopy a) 80% Red Maple 15% Sweet Gum 5% Loblolly Surface flooding up to 1.0 FT. in depth Sub-Canopy a) Trumpeter Vine Magnolia Heath Bush Site is getting wetter Sucession - trees dying out - increasingly wetter		
	Two Adjacent Small Fields: Vegetation:	Surface Spike Rush Water persline Sedges Cockle Berry Soft Rush		
7	0.0 FT. - 1.5 FT.	Dark Brown Sand	20% Fines	SM
	1.5 FT. -	Grayish Sand Mottling at 1.5 FT. Water at 2.5 FT.	20-25% Fines	
	Vegetation:	Upper Canopy a) 90% Loblolly Pine 10% Sweet Gum		

SOIL AUGER HOLE NUMBER	DESCRIPTION			
7 (cont.)		Sub-Canopy a) 50% Red Maple 50% Sweet Gum Ground Cover a) 90% Poison Ivy 10% Trumpeter Vine		
8	0.0 FT. - 1.2 FT. 1.2 FT. - Vegetation:	Grayish Brown Sand Sand (Heavy Mottling) Mottling at 1.0 FT. Upper Canopy a) 95% Loblolly Pine Sub-Canopy a) Cherry Dogwood Maple Sweet Gum Holly White Mulberry	20% Fines 40% Fines	SM
9	0.0 FT. - 2.5 FT. 2.5 FT. - 3.5 FT. Vegetation:	Sand Sand (Mottling) Upper Canopy a) 50% White Oak 30% Red oak 20% Pine Sub-Canopy a) Red Maple Holly Black Gum Sweet Gum Shrub - Sweet Pepper Bush	10-15% Fines 10-15% Fines	
10	0.0 FT. - 0.6 FT. 0.6 FT. - Vegetation:	Dark Brown Silt Grayish Brown Sand Water at 1.2 FT. Upper Canopy a) 90% Red Maple 10% White Oak Sub-Canopy a) 90% Holly 10% Red Maple Floor Cover a) Sweet Pepper Bush	 30% Fines	ML SC

SOIL AUGER HOLE NUMBER	DESCRIPTION			
11	0.0 FT. - 1.2 FT.	Grayish Brown Sand Mottling at 1.2 FT.	20% Fines	
	Vegetation:	Upper Canopy a) 80% Pine 10% Maple 10% Assorted Oak, Willow Sub-Canopy a) Red Maple Sweet Gum Black Gum Holly Floor a) Sweet Pepper Bush		
12	0.0 FT. - 1.0 FT.	Dark Brown Silt Low Plasticity		ML
	1.0 FT. -	Grayish Brown Sand	45% Fines	SC
	Vegetation:	Upper Canopy a) 10% Pine 80% Red Maple 10% Willow Oak, Water Oak Sub-Canopy a) 80% Black Gum 20% Red Maple Floor a) Sedges Lizard Tail Spagnum Magnolia		
	Old Ditch Bottom 6" Depth			
13	0.0 FT. - 1.0 FT.	Reddish Brown Sand	15-20% Fines	SM
	1.0 FT. -	Mottling at 1.0 FT.		
	Vegetation:	Upper Canopy a) 100% Loblolly Pine Sub-Canopy a) Black Gum Floor a) Dogwood Red Maple Holly Pine Mulch		

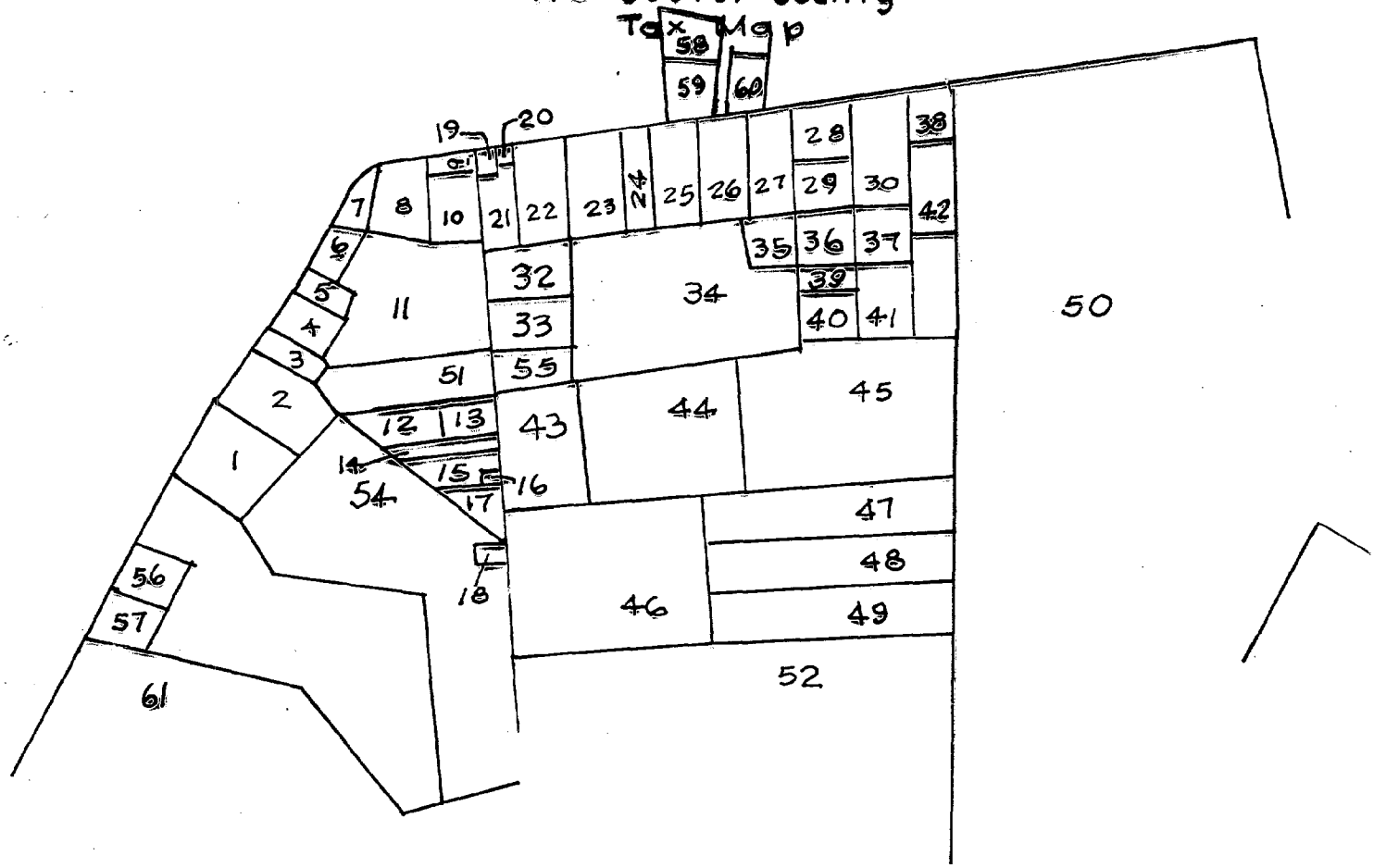
SOIL AUGER HOLE NUMBER	DESCRIPTION			
30	0.0 FT. - 0.7 FT.	Grayish Brown Sand	20% Fines	SM
	0.7 FT. - 2.0 FT.	Yellowish Brown Sand	20% Fines	
	2.0 FT. -	Mottling		
	Vegetation:	Farmed Land		
		Ragweed, Stickweed/Horseweed, Wild Daisies, Dandelion, Oster, Field Bind Weed, Paspalum, Marigold, Foxtail, Broom Sedge (1)		
	Secessional Field	Looks as if first year of not being tilled		
31	0.0 FT. - 0.6 FT.	Grayish Brown Sand	15-20% Fines	SM
	0.6 FT. -	Yellowish Brown Sand	15-20% Fines	SM
		Mottling at 2.3 FT.		
	No Aquatic Vegetation:	Maple, Sweet Gum, Loblolly Pine		
	Mowed:	Less than 6"		
	Annuals:	Foxtail, Ragweed, Field Bind Weed, Potomogeation Sorrel		
	Pre Annual:	Broom Sedge, Osters, Queen Anne Lace		
32	0.0 FT. - 1.0 FT.	Dark Brown Sand	15-20% Fines	SM
		Mottling at 4"		
	1.0 FT. -	Gray Sand	20-25% Fines	SM
		Heavy Mottling		
		Water at 2.0 FT.		
	Farmed Wetland/or Trying Dominant Vegetation:	Fall Panicum, Bur-reed, Ragweed, Barnyard Grass, Foxtail, Smartweed, (Pennsylvanicum)		
	Sub-Vegetation:	Spike Rush, Soft Rush, Bull Rush, Sypurerus, St. Johns Wart		
33	0.0 FT. - 0.7 FT.	Grayish Brown Sand	20% Fines	SM
	0.7 FT. - 4.0 FT.	Yellowish Brown Sand	20% Fines	SM
	4.0 FT. -	Clay	40% Fine Sand	CL
		Mottling at 2.6 FT. (Perched Water)		
	Ground Cover:	Soybeans		
34	0.0 FT. - 1.0 FT.	Dark Gray Sand	15% Fines	SM
	1.0 FT. - 2.0 FT.	Gray Sand (Mottling)	20% Fines	SM
	2.0 FT. - 2.5 FT.	Gray Clay	30% Fine Sand	CL
	2.5 FT. -	Gray Clay (Mottling)		CL

SOIL AUGER HOLE NUMBER	DESCRIPTION			
35	0.0 FT. - 1.0 FT.	Dark Gray Sand	15% Fines	SM
	1.0 FT. - 1.3 FT.	Hard, Dry Layer		SM
	1.3 FT. - 1.8 FT.	Reddish Brown Sand	15% Fines	SM
	1.8 FT. -	Gray Sand	15% Fines Wet	
	Ground Cover:	Soybeans		
36	0.0 FT. - 1.8 FT.	Dark Black-Gray Sand	20% Fines	SM
	1.8 FT. - 2.0 FT.	Dark Gray Silt		ML
	2.0 FT. -	Gray Sand	15% Fines	SM
		Water at 2.0 FT.		
	(Shurb Swamp)			
	Wetlands:	Button Bush, Hibiscus, Barnyard Grass, Swamp Rose		
37	0.0 FT. - 1.0 FT.	Grayish Brown Sand	20% Fines	SM
	1.0 FT. - 3.0 FT.	Yellowish Brown Sand (Mottling)	20% Fines	SM
	3.0 FT. - 4.0 FT.	Reddish Brown Sand	5% Fines	SP
	4.0 FT. - 4.3 FT.	Grayish Brown Sand	25% Fines	SM
	4.3 FT. - 4.6 FT.	Clay		CL
38	0.0 FT. - 1.0 FT.	Grayish Brown Sand Very Fine Sand	20% Fines	SM
	1.0 FT. - 1.8 FT.	Grayish Brown Sand (Mottling)		SM
	1.8 FT. - 3.0 FT.	Yellowish Brown Sand (Mottling)	25-30% Fines	SC
39	0.0 FT. - 2.5 FT.	Yellowish Brown Sand Mottling at 1.5 FT.	20% Fines	SM
	2.5 FT. - 5.0 FT.	Slight change from above		

EXHIBIT 6

LAND OWNERSHIP

Land Ownership
Worcester County
Tax Map



UNIONVILLE
Scale: 1" = 660'

Exhibit 6

UNIONVILLE DRAINAGE STUDY

LIST OF PROPERTY OWNERS

MAP NO.	TAX MAP NO.83 MAP PARCEL NO.	NAME AND ADDRESS	ACREAGE
1	P. 81	Jordan, Gaines A. & Thelma Rt. 1, Box 364 Pocomoke, MD 21851	2.3
2	P. 82	Bishop, Ambrose & Bessie M. Rt. 2, Box 121 Princess Anne, MD 21853	1.8
3	P. 206	Williams, Violet B. Rt. 1, Box 362 Pocomoke, MD 21851	0.7
4	P. 83	Hardy, Alonzo & Anna Rt. 1, Box 361 Pocomoke, MD 21851	1.0
5	P. 84	Robins, Richard Larry & Barbara A. Rt. 1, Box 360 Pocomoke, MD 21851	1.0
6	P. 85	Hall, Sylvester L. & Shirley M. Rt. 1, Box 359 Pocomoke, MD 21851	1.0
7	P. 86	Mason Masonic Lodge # 45 c/o Paul Evans P.O. Box 112 Marion, MD 21838	1.0
8	P. 25	Cropper, Clarence & Mary Rt. 1, Box 358A Pocomoke, MD 21851	1.0
9	P/O 26	Merrill, William E. & Willie A. Rt. 1, Box 369 Pocomoke, MD 21851	LOT
10	P. 222	Merrill, Armond E. Rt. 1, Box 371 Pocomoke, MD 21851	0.9

MAP NO.	TAX MAP NO.83 MAP PARCEL NO.	NAME AND ADDRESS	ACREAGE
11	P. 26	Merrill, William E. & Willie A. Rt. 1, Box 369 Pocomoke, MD 21851	6.8
12	P. 41	Smith, Elmer J. & Elsie M. 429 Bank Street Pocomoke, MD 21851	1.1
13	P. 34	Smith, Elmer J. & Elsie M. 429 Bank Street Pocomoke, MD 21851	0.7
14	P. 207	Ames, James & Zeola Smith Rt. 1, Box 373 Pocomoke, MD 21851	0.4
15	P. 1	Smith, Lula P. & Elmer 429 Bank Street Pocomoke, MD 21851	0.6
16	P. 42	Hill, Charles E. & Martha F. c/o Madeline Robinson Rt. 1, Box 13 Westover, MD 21871	LOT
17	P. 43	Ames, James T. & Zeola V. Rt. 1, Box 373 Pocomoke, MD 21851	1.0
18	P. 112	Blount, Allen B., Jr. & Mirian B. Golden 626 Cedar Street Pocomoke, MD 21851	0.25
19	P. 111	Norma Lenell Evans P.O. Box 244 New Church, VA 23415	LOT
20	P. 87	Waters, Leroy Thomas Rt. 1, Box 353 Pocomoke, MD 21851	0.2
21	P. 122	Wilson, Sara Rt. 1, Box 370 Pocomoke, MD 21851	1.0
22	P. 88	Sidney, Robert L. & Helen P. 1430 Unionville Road Pocomoke, MD 21851	2.0

MAP NO.	TAX MAP NO.83 MAP PARCEL NO.	NAME AND ADDRESS	ACREAGE
23	P. 89	Waters, Gladstone, Jr. & Elnora Rt. 1, Box 350 Pocomoke, MD 21851	2.0
24	P. 90	Dix, Luther L. & Lillian M. P.O. Box 136 Hamilton Grange Station New York, NY 10031	1.0
25	P. 91	Brinkley, Lorraine 6912 Ibis Place Philadelphia, PA 19142	1.0
26	P. 92	Brinkley, Lorraine 6912 Ibis Place Philadelphia, PA 19142	2.0
27	P. 30	Dix, Luther L., Jr. P.O. Box 136 Hamilton Grange Station New York, NY 10031	2.0
28	P. 99	Harmon, Wardell T. & Gladys Waters Rt. 1, Box 334 Pocomoke, MD 21851	2.0
29	P. 98	Waters, Bertie, Rueben & Samuel Etal Rt. 1, Box 334 Pocomoke, MD 21851	1.0
30	P. 101	Smith, Jerry B. & Bonnie S. Hart & Rickey S. Smith 2333 Old Snow Hill Road Pocomoke, MD 21851	2.0
31			LOT
32	P. 121	Justis, George A. Rt. 1, Box 372 Pocomoke, MD 21851	2.0
33	P. 120	Fields, Cecil R. & Amanda Jean Allen Etal Rt. 1, Box 372A Pocomoke, MD 21851	1.7
34	P. 28	Coulbourne, John M. Rt. 1, Box 336 Pocomoke, MD 21851	8.9

MAP NO.	TAX MAP NO.83 MAP PARCEL NO.	NAME AND ADDRESS	ACREAGE
35	P. 237	Wanamaker, Lawrence & Brenda V. P.O. Box 327 Pocomoke, MD 21851	1.0
36	P. 31	Coulbourne, John M. Rt. 1, Box 336 Pocomoke, MD 21851	1.0
37	P. 32	Ames, Barnett & Albert Rt. 1, Box 333 Pocomoke, MD 21851	1.0
38	P. 97	Harmon, Willie R. & Mary Ann Rt. 1, Box 331 Pocomoke, MD 21851	1.0
39	P. 95	Smith, Preston N. & Bessie L. 2047 Groton Road Pocomoke, MD 21851	2.0
40	P. 94	Savage, Annie Mae P.O. Box 371 Pocomoke, MD 21851	1.0
41	P. 93	Smith, Preston & Bessie L. Rt. 2, Box 433 Pocomoke, MD 21851	2.0
42	P. 96	Harmon, Willie R. & Mary Ann Rt. 1, Box 331 Pocomoke, MD 21851	2.0
43	P. 118	Merrill, Lora 6211 Jefferson Street Philadelphia, PA 19151	5.0
44	P. 119	Merrill, Lora 6211 Jefferson Street Philadelphia, PA 19151	5.0
45	P. 100	Smith, Jerry B. & Bonnie S. Hart & Rickey S. Smith 2333 Old Snow Hill Road Pocomoke, MD 21851	10.0
46	P. 35	Waters, Alonzo, Jr. & Agnes 4242 Pennsgrobe Street Philadelphia, PA 19104	10.0

MAP NO.	TAX MAP NO.83 MAP PARCEL NO.	NAME AND ADDRESS	ACREAGE
47	P. 115	Williams, Carroll S. 1738 Cypress Road Pocomoke, MD 21851	3.5
48	P. 116	Cropper, William Green & Mary Ellen Rt. 1, Box 77 Newark, MD 21841	3.5
49	P. 117	Cropper, William Green & Mary Ellen Rt. 1, Box 77 Newark, MD 21841	1.5
50	P. 102	Jackson, Daniel L. & Carrie F. Box 85 New Church, VA 23415	98.0
51	P. 253	Marshall, Cheryl Rt. 2, Box 69 Pocomoke, MD 21851	2.76
52	P. 240	Jones, Richard A. Rt. 2, Box 294 Pocomoke, MD 21851	21.49
53	P. 80	Custis, William J. & Margaret F. 1754 Sand Pit Road Pocomoke, MD 21851	17.07
54	P. 113	Downing, William 307 Gwynn Avenue Baltimore, MD 21229	8.5
55	P. 248	Wallace, Ervin & Faith T. 1812 Cypress Road Pocomoke, MD 21851	1.0
56	P. 230	Singleton, Louis & Delois P.O. Box 331 Pocomoke, MD 21851	1.0
57	P. 231	Wise, Lawrence & Julia A. Rt. 1, Box 365A Pocomoke, MD 21851	1.0
58	P. 216 Lot 2-B	Byrd, C. Ames & Donna M. & William R., Jr. & Audrey K. 6th East Market Street Pocomoke, MD 21851	LOT

MAP NO.	TAX MAP NO.83 MAP PARCEL NO.	NAME AND ADDRESS	ACREAGE
59	P. 216 Lot 1-B	Fosque, William & Connie J. Rt. 1, Box 349 Pocomoke, MD 21851	LOT
60	P. 216 Lot 1-A	Downing, Garnet A., Jr. & Dolores C. 1519 Unionville Road Pocomoke, MD 21851	LOT
	TAX MAP NO.91 MAP PARCEL NO.		
61	P - 1	Merrill, William E. & Willie Anna Rt. 1, Box 369 Pocomoke, MD 21851	16.0

CORRESPONDENCE

November 9, 1990

James O. McIntyre
Rt. 1, Box 780
Mardela Springs, MD 21837

Mr. Tom Tapley
Water Pollution Cost Share Program
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

Dear Mr. Tapley:

I am presently working on a drainage evaluation for the Worcester Counry Commissioners of an area in the southern part of Worcester County, in particular, the Unionville area. The evaluation would recommend the re-excavation of previously excavated ditches, that were not maintained, in order to alleviate their present drainage problem. The area of consideration is a low income community of which approximately 33% is woodland, 33% is cropland and 33% is residential.

I am contacting you to inquire if your organization may have funding available to aid with this project if it were to become a reality. Any information you could provide pertaining to eligibility of this project for financial assistance would be greatly appreciated.

Thank You,

James O. McIntyre

November 9, 1990

James O. McIntyre
Rt. 1, Box 780
Mardela Springs, MD 21837

Mr. Woody Francis
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203

Dear Mr. Francis:

I am presently working on a drainage evaluation for the Worcester Counry Commissioners of an area in the southern part of Worcester County, in particular, the Unionville area. (Map Attached)

The wetland investigation reveals that some areas within the drainage area would be considered non-tidal wetlands (Palustrine forested, palustrine emergent and approximately 60% hydric soils). The area of consideration is a low income community of which approximately 33% is woodland, 33% is cropland and 33% is residential. The area is very poorly drained which adversely affects farm crops and home sites. Corps permits may be necessary.

This letter is to alert you to the possibility of a project and for any information that you could relate to me pertaining to the changing status of wetlands (farmed wetlands anyway).

Further information can be obtained from Bruce Nichols, District Conservationist, Soil Conservation Service, Snow Hill, Maryland 21863.

Thank You,

James O. McIntyre

November 9, 1990

James O. McIntyre
Rt. 1, Box 780
Mardela Springs, MD 21837

Mr. Donald MacLauchlan
Assistant Secretary
Maryland Forest, Parks and Wildlife Service
Tawes State Office Building
Annapolis, Maryland 21401

Dear Mr. MacLauchlan:

I am presently working on a drainage evaluation for the Worcester Counry Commissioners of an area in the southern part of Worcester County, in particular, the Unionville area. Part of the evaluation necessitates information pertaining to rare, threatened and endangered species. Enclosed is a map delineating the area of interest.

I would greatly appreciate if you could provide a list of the rare, threatened or endangered species that may occur in the delineated area.

Thank You,

James O. McIntyre

November 9, 1990

James O. McIntyre
Rt. 1, Box 780
Mardela Springs, MD 21837

Mr. Mike Haire
Chesapeake Bay and Special Projects Program
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

Dear Mr. Haire:

I am presently working on a drainage evaluation for the Worcester Counry Commissioners of an area in the southern part of Worcester County, in particular, the Unionville area. The evaluation would recommend the re-excavation of previously excavated ditches, that were not maintained, in order to alleviate their present drainage problem. The area of consideration is a low income community of which approximately 33% is woodland, 33% is cropland and 33% is residential.

I am contacting you to inquire if your organization may have funding available to aid with this project if it were to become a reality. Any information you could provide pertaining to eligibility of this project for financial assistance would be greatly appreciated.

Thank You,

James O. McIntyre

November 9, 1990

James O. McIntyre
Rt. 1, Box 780
Mardela Springs, MD 21837

Mr. Ken Pensyl
Program Administrator
Sediment and Storm Water Division
Water Quality Financing Administration
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

Dear Mr. Pensyl:

I am presently working on a drainage evaluation for the Worcester Counry Commissioners of an area in the southern part of Worcester County, in particular, the Unionville area. The evaluation would recommend the re-excavation of previously excavated ditches, that were not maintained, in order to alleviate their present drainage problem. The area of consideration is a low income community of which approximately 33% is woodland, 33% is cropland and 33% is residential.

I am contacting you to inquire if your organization may have funding available to aid with this project if it were to become a reality. Any information you could provide pertaining to eligibility of this project for financial assistance would be greatly appreciated.

Thank You,

James O. McIntyre

ENGINEERING PLAN

UNIONVILLE DRAINAGE STUDY
WORCESTER COUNTY, MARYLAND

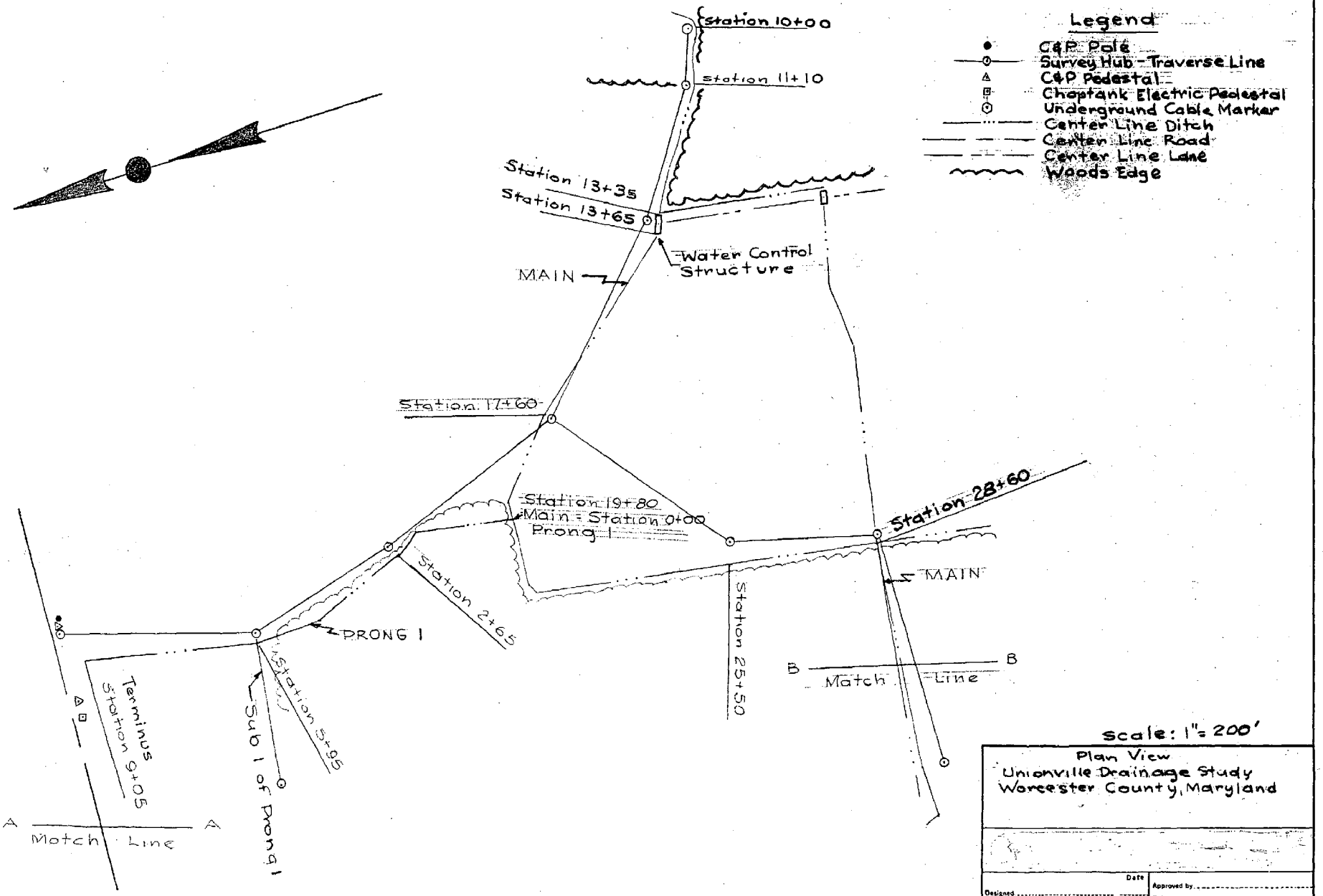
AUTHORIZED BY

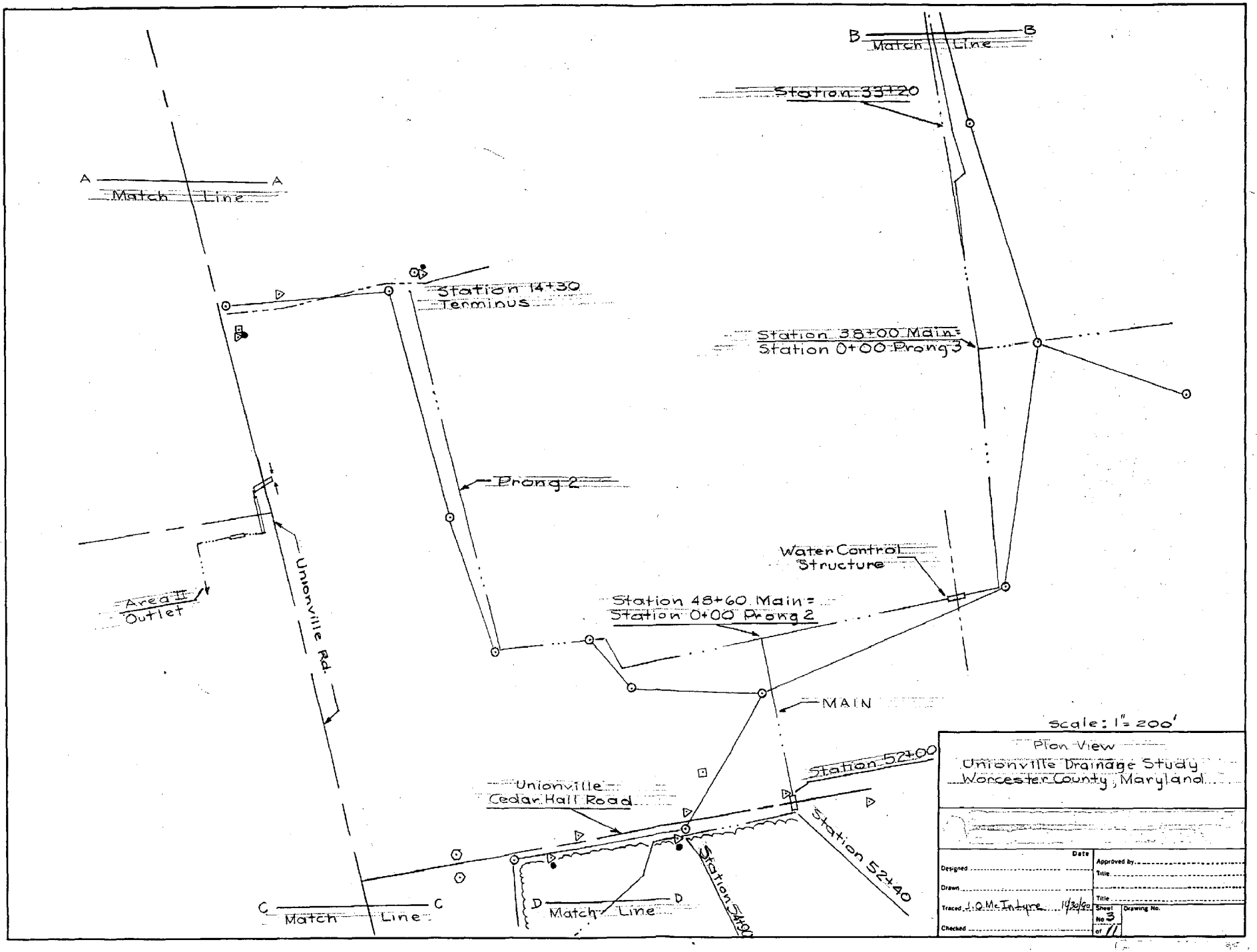
WORCESTER COUNTY COMMISSIONERS

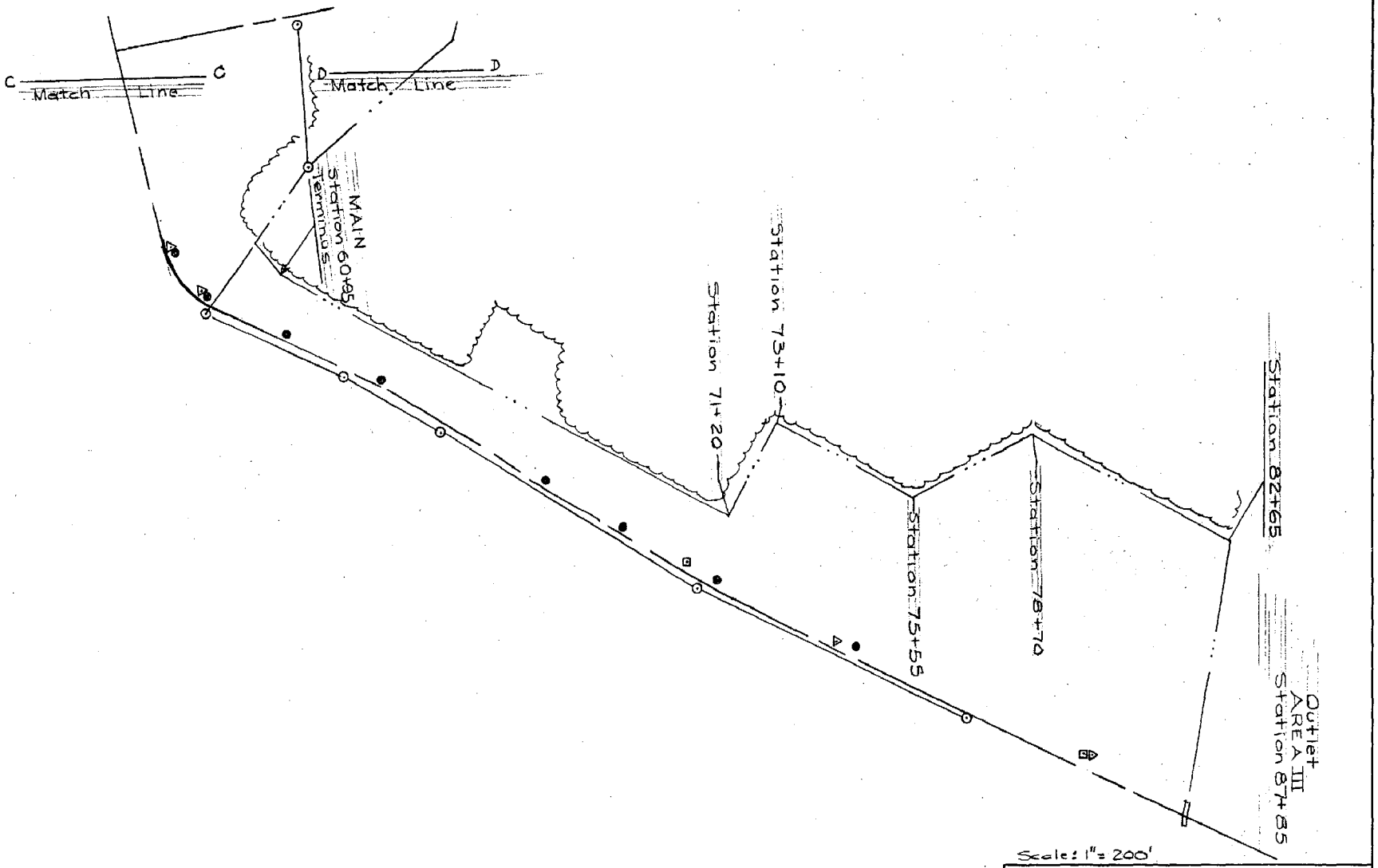
INDEX

Cover Sheet
Unionville Drainage Study

	Date		
Designed		Approved by	
Drawn		Title	
Traced McIntyre	10/30/78	Title	
Checked		Sheet No. 1 of 11	Drawing No.


Legend
C&P Pole
Survey Hub - Traverse Line
C&P Pedestal
Choptank Electric Pedestal
Underground Cable Marker
Center Line Ditch
Center Line Road
Center Line Lane
Woods Edge
Station 10+00
Station 11+10
Station 13+35
Station 13+65
Water Control Structure
MAIN
Station 17+60
Station 19+80
Main - Station 0+00
Prong 1
Station 28+60
Station 2+65
PRONG 1
MAIN
Station 25+50
B
Match Line
B
A
Terminus Station 9+05
Sub 1 of Prong 1
Station 5+95
A
Match Line
A
scale: 1" = 200'
Plan View
Unionville Drainage Study
Worcester County, Maryland
Designed
Drawn
Traced McIntyre 10/3/90
Checked
Date
Approved by
Title
Title
Sheet No 2 of 11
Drawing No.


A
A
Match Line
B
B
Match Line
Station 33+20
Station 14+30
Terminus
Station 38+00 Main=
Station 0+00 Prong 3
Prong 2
Water Control
Structure
Area II
Outlet
Unionville Rd.
Station 48+60 Main=
Station 0+00 Prong 2
MAIN
Station 52+00
Unionville
Cedar Hall Road
Station 52+40
Station 54+90
C
C
Match Line
D
D
Match Line
scale: 1" = 200'
Plan View
Unionville Drainage Study
Worcester County, Maryland
Designed
Drawn
Traced J.O.McIntyre 11/30/90
Checked
Date
Approved by
Title
Title
Sheet No 3 of 11
Drawing No.

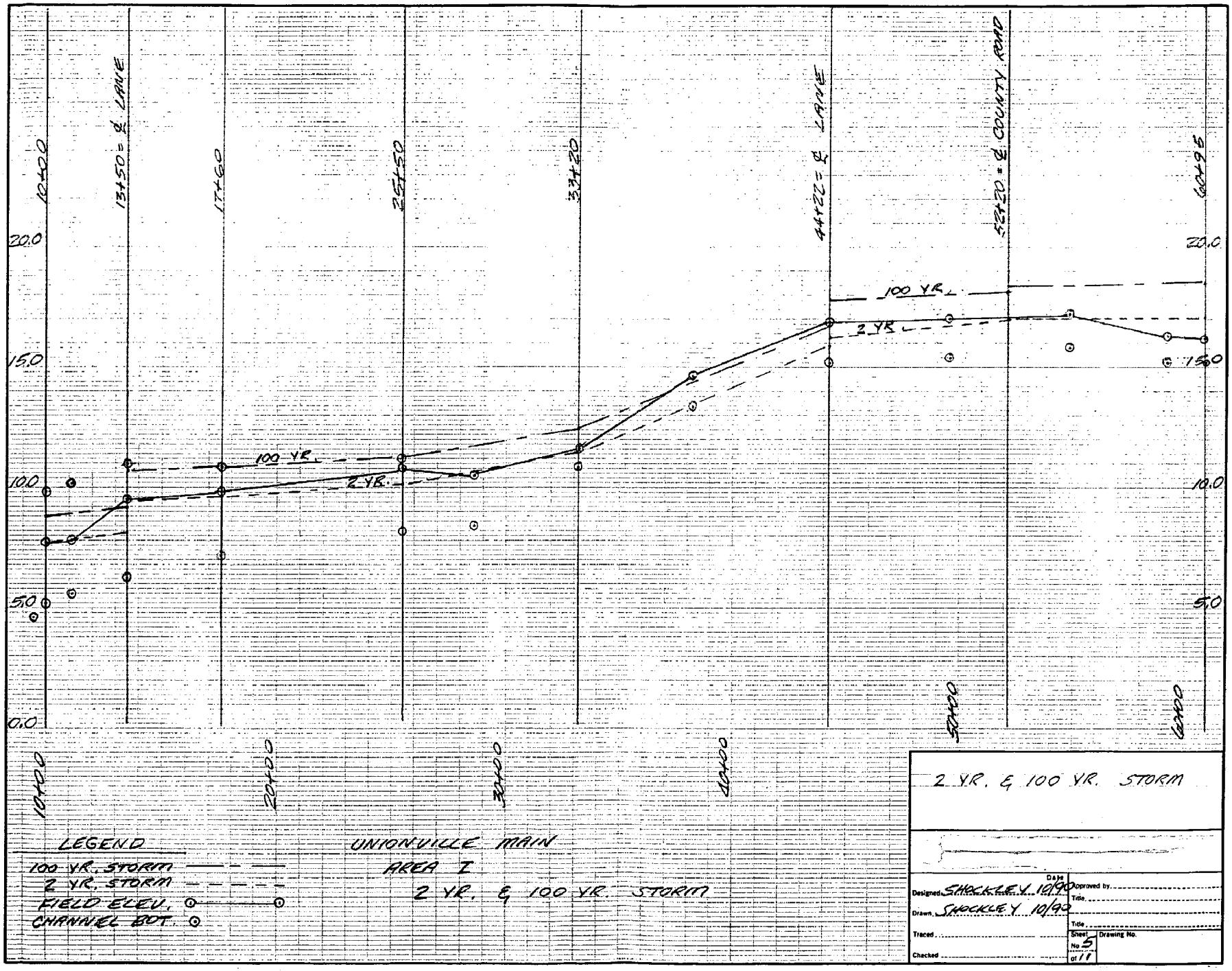


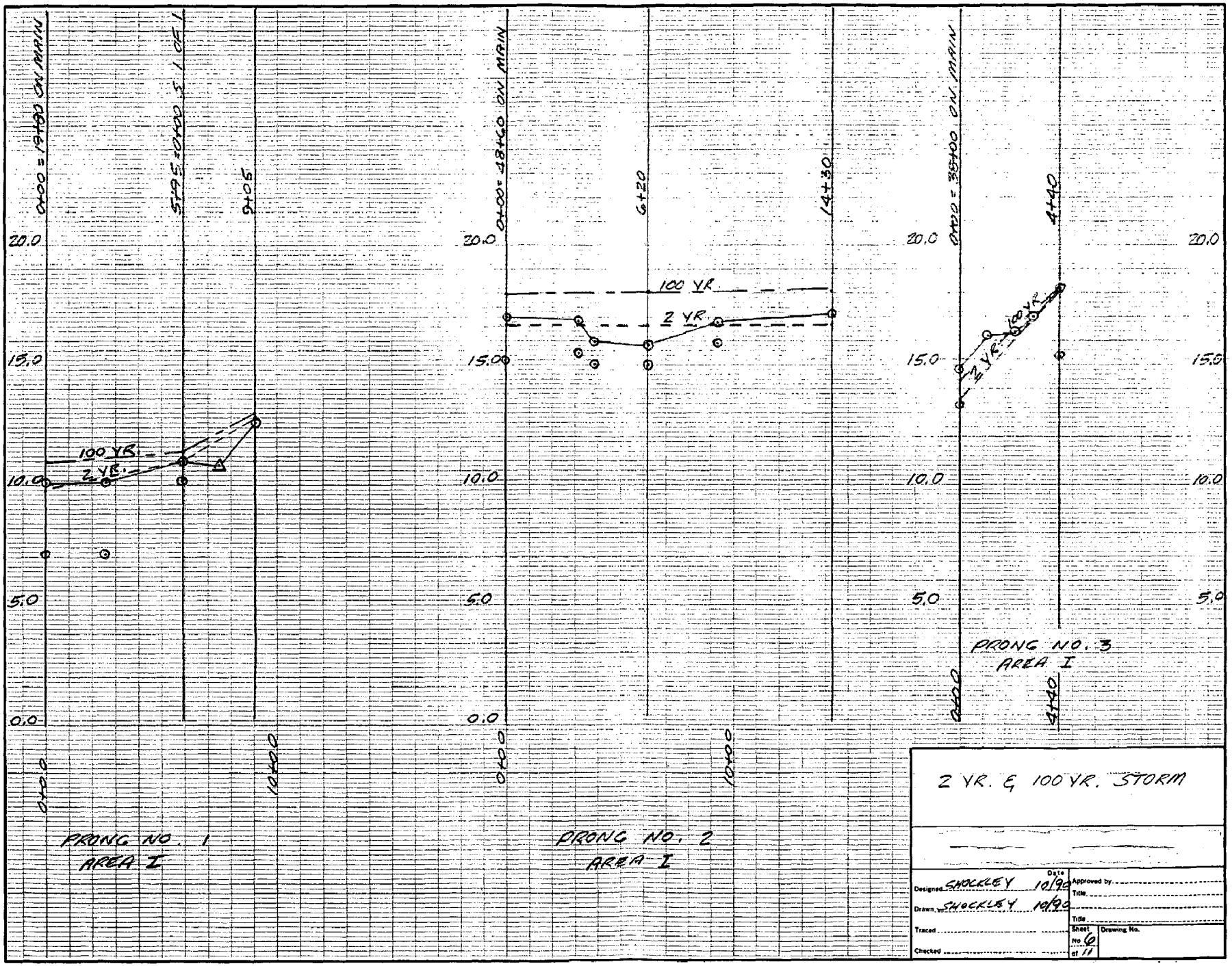
Scale: 1" = 200'

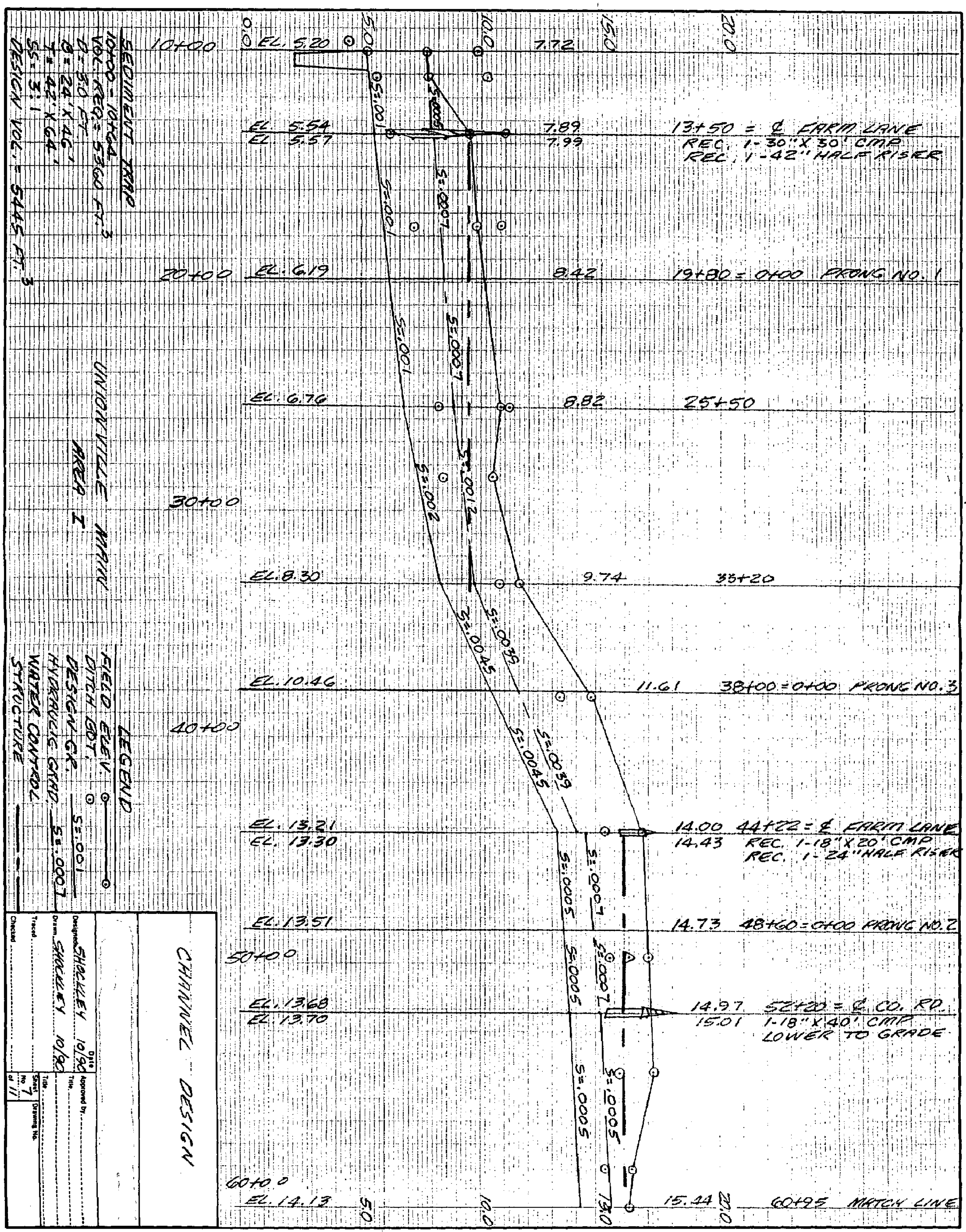
Plan View

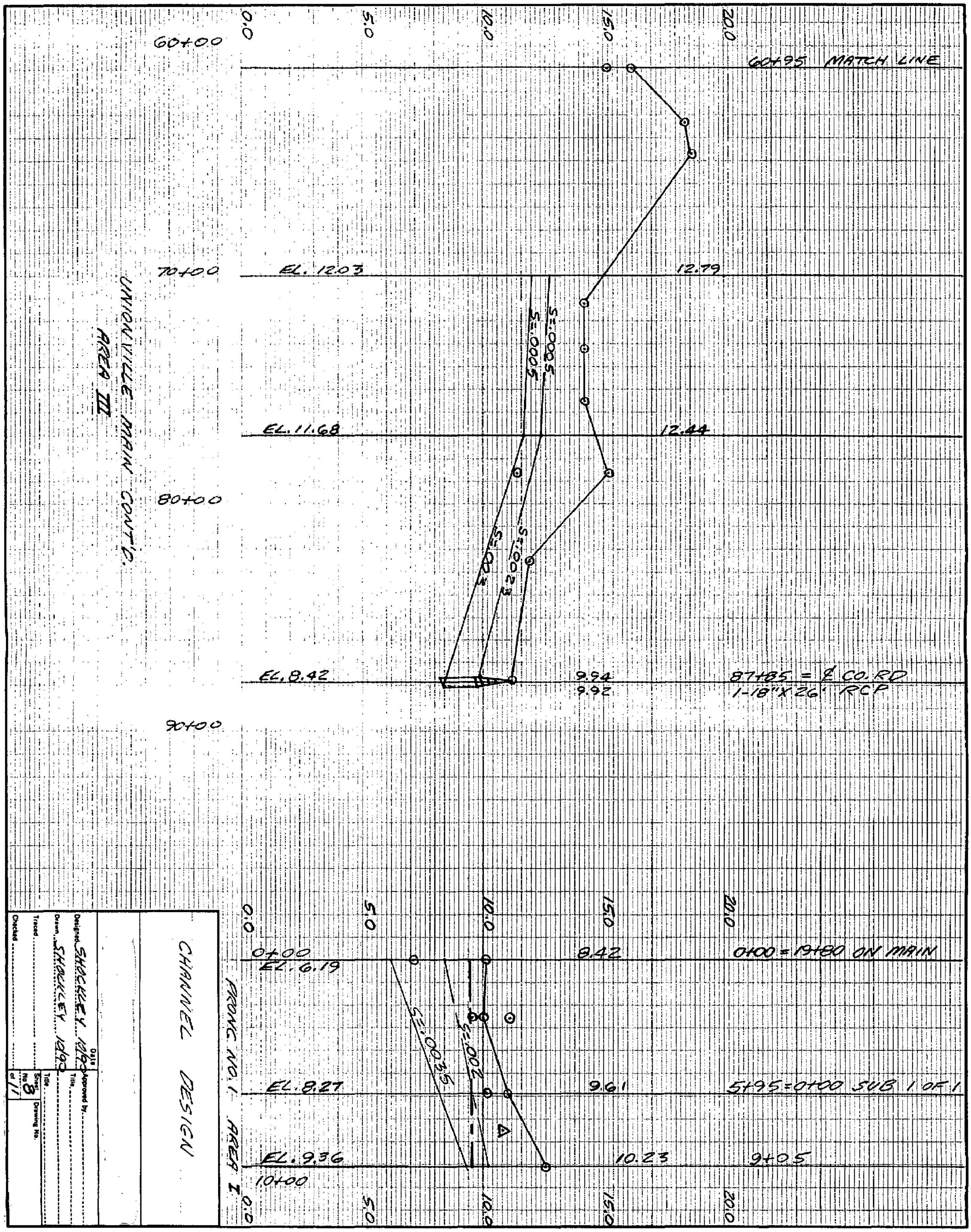
Unionville Drainage Study
Worcester County, Maryland

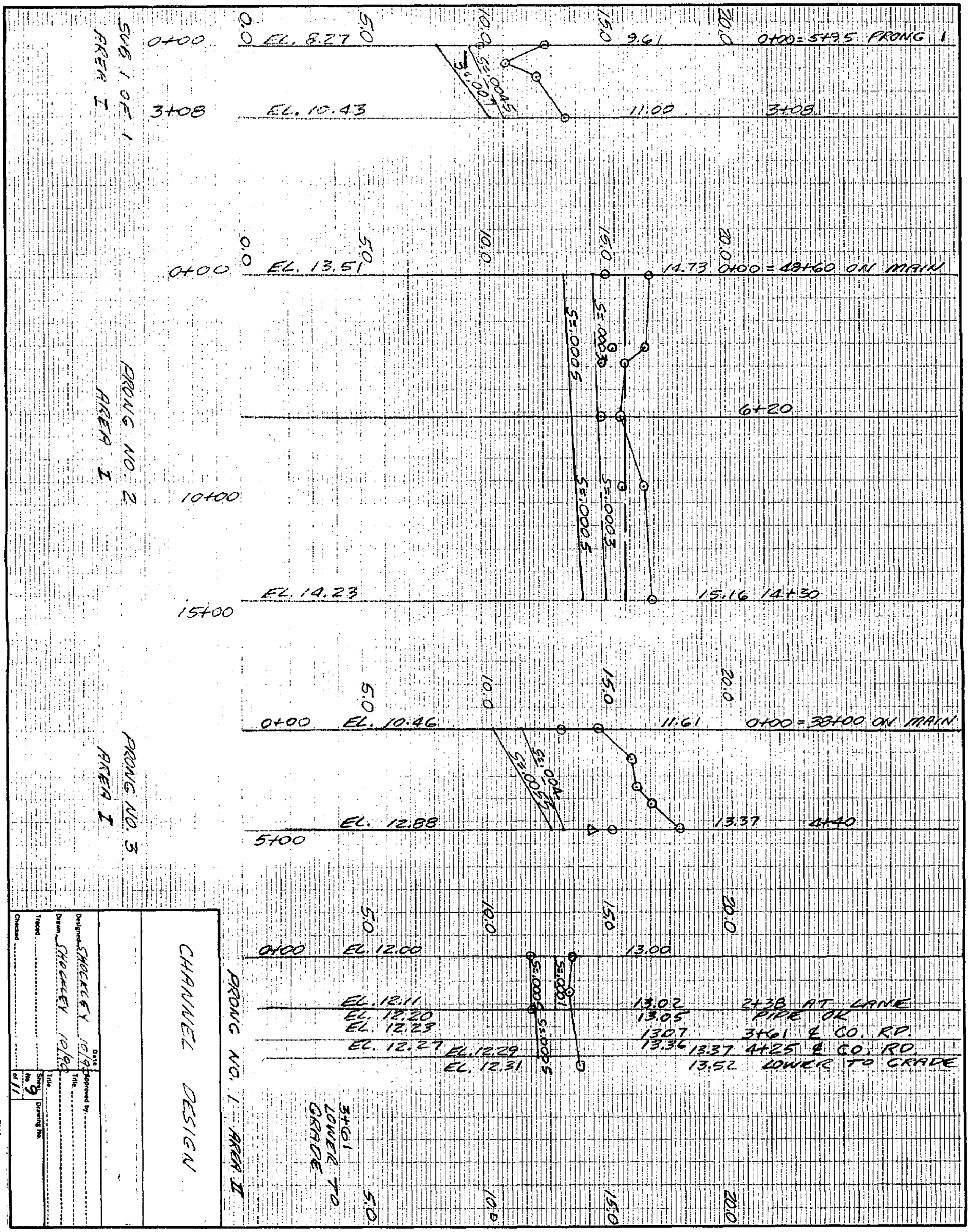
Designed	Date	Approved by
Drawn		Title
Traced J.O. McIntyre	10/3/90	Title
Checked		Sheet No. 4 of 11 — Drawing No.

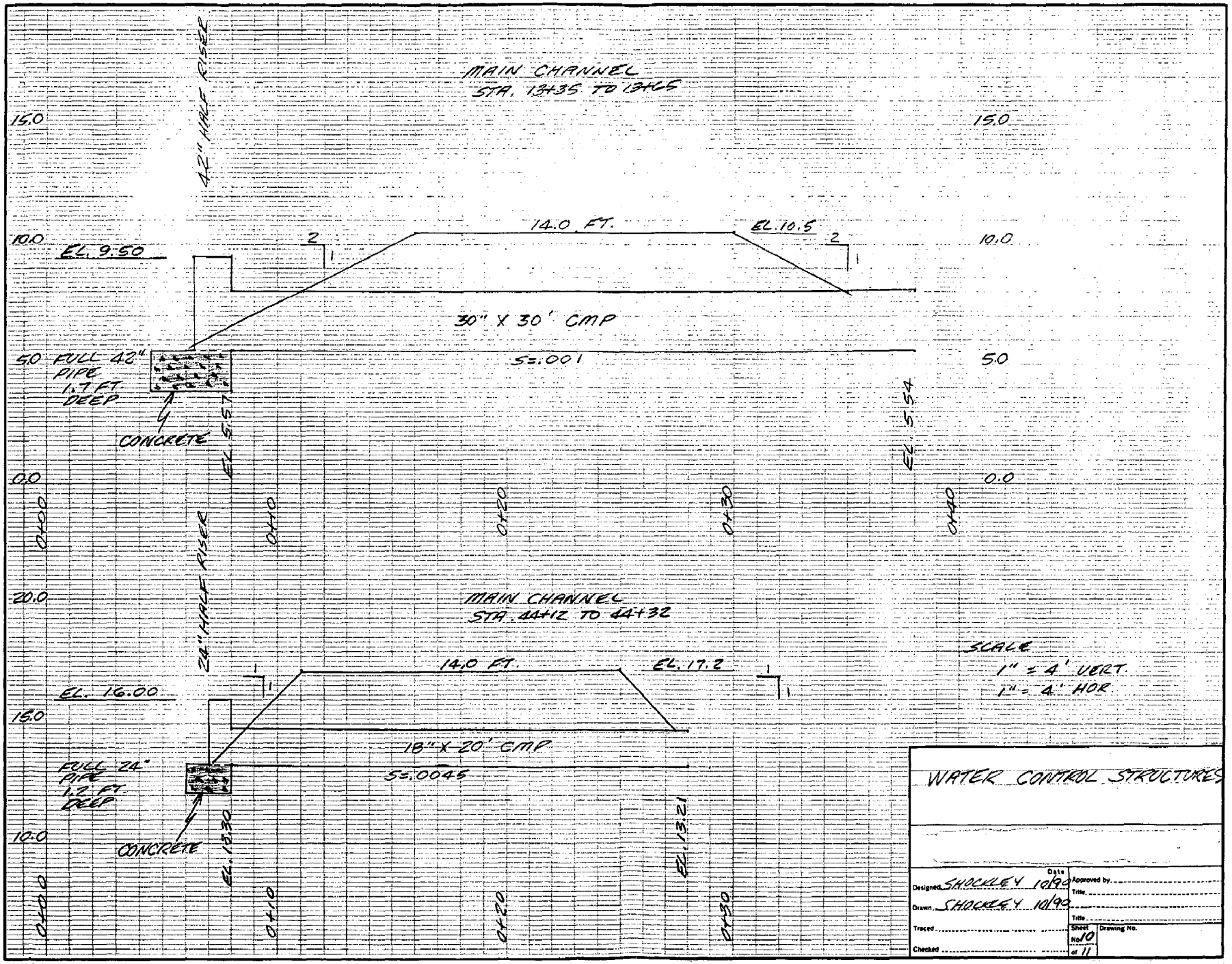

13+50 = ℄ LANE
17+60
25+50
33+20
44+48 = ℄ LANE
52+25 = ℄ COUNTY ROAD
60+95
20.0
15.0
10.0
5.0
0.0
100 YR.
2 YR.
10+00
20+00
30+00
40+00
50+00
60+00
LEGEND
100 YR. STORM
2 YR. STORM
FIELD ELEV.
CHANNEL BOT.
UNIONVILLE MAIN
AREA I
2 YR. & 100 YR. STORM
2 YR. & 100 YR. STORM
Designed SHOCKLEY 10/92
Drawn SHOCKLEY 10/92
Traced
Checked
Approved by
Title
Sheet No. 5 of 11
Drawing No.


0+00 = 19+80 ON MAIN
1+50 = STA. 5+75
5+75
20.0
15.0
10.0
5.0
0.0
100 YR.
2 YR.
0+00
10+00
PRONG NO. 1
AREA I
0+00 = 18+40 ON MAIN
6+20
14+30
20.0
15.0
10.0
5.0
0.0
100 YR.
2 YR.
0+00
10+00
PRONG NO. 2
AREA I
0+00 = 35+00 ON MAIN
4+40
20.0
15.0
10.0
5.0
0.0
100 YR.
2 YR.
0+00
4+40
PRONG NO. 3
AREA I
2 YR. & 100 YR. STORM
Designed SHOCKLEY 10/92
Drawn SHOCKLEY 10/92
Traced
Checked
Approved by
Title
Sheet No 6 of 11
Drawing No.


SEDIMENT TRAP
10+00 - 10+64
VOL. REQ. = 5360 FT.3
D = 5.0 FT
B = 24' X 46'
T = 42' X 64'
SS = 3:1
DESIGN VOL. = 5445 FT.3
UNIONVILLE MAIN
AREA I
LEGEND
FIELD ELEV.
DITCH BOT.
DESIGN GR.
HYDRAULIC GRAD.
WATER CONTROL STRUCTURE
S=.001
S=.0007
CHANNEL DESIGN
Designed SHOCKLEY 10/90
Drawn SHOCKLEY 10/90
Traced
Checked
Approved by
Title
Sheet 7 of 11
Drawing No.
0.0
5.0
10.0
15.0
20.0
10+00
EL. 5.20
7.72
EL. 5.54
EL. 5.57
7.89
7.99
13+50 = ℄ FARM LANE
REC. 1-30" X 30' CMP
REC. 1-42" HALF RISER
20+00
EL. 6.19
8.42
19+80 = 0+00 PRONG NO. 1
EL. 6.76
8.82
25+50
30+00
EL. 8.30
9.74
35+20
EL. 10.46
11.61
38+00 = 0+00 PRONG NO. 3
40+00
EL. 13.21
EL. 13.30
14.00
14.43
44+22 = ℄ FARM LANE
REC. 1-18" X 20' CMP
REC. 1-24" HALF RISER
EL. 13.51
14.73
48+60 = 0+00 PRONG NO. 2
50+00
EL. 13.68
EL. 13.70
14.97
15.01
52+20 = ℄ CO. RD.
1-18" X 40' CMP
LOWER TO GRADE
60+00
EL. 14.13
15.44
60+95 MATCH LINE
S=.001
S=.0007
S=.002
S=.0012
S=.0045
S=.0039
S=.0005
S=.0007

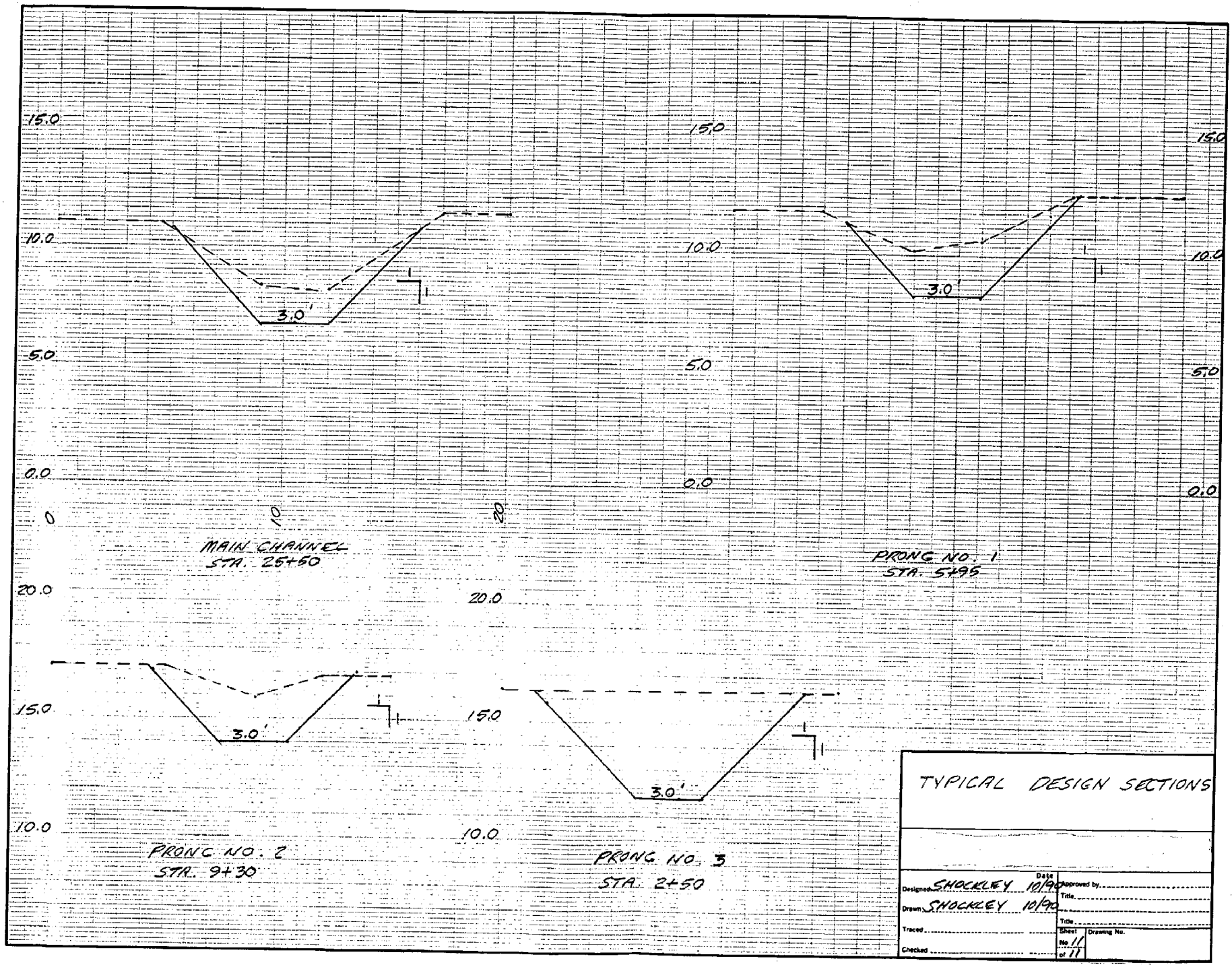

UNIONVILLE MAIN CONT'D.
AREA III
60+00
70+00
80+00
90+00
0.0
5.0
10.0
15.0
20.0
60+95 MATCH LINE
EL. 12.03
12.79
S=.0005
S=.0005
EL. 11.68
12.44
S=.0005
S=.002
EL. 8.42
9.94
9.92
87+85 = ℄ CO. RD
1-18"X26' RCP
0+00
EL. 6.19
8.42
0+00=19+80 ON MAIN
PRONG NO. 1 AREA I
S=.0035
S=.002
EL. 8.27
9.61
5+95=0+00 SUB 1 OF 1
EL. 9.36
10.23
9+05
10+00
CHANNEL DESIGN
Designed SHOCKLEY 10/90
Drawn SHOCKLEY 10/90
Traced
Checked
Approved by
Title
Sheet No. 8 of 11
Drawing No.


SUB 1 OF 1
AREA I
0+00
EL. 8.27
9.61
0+00 = 5+95 PRONG 1
S=.0045
S=.007
3+08
EL. 10.43
11.00
3+08
PRONG NO. 2
AREA I
0+00
EL. 13.51
14.73 0+00 = 48+60 ON MAIN
S=.0005
S=.0003
6+20
10+00
EL. 14.23
15.16 14+30
15+00
PRONG NO. 3
AREA I
0+00
EL. 10.46
11.61
0+00 = 38+00 ON MAIN
S=.004
S=.0025
EL. 12.88
13.37
4+40
5+00
PRONG NO. 1 - AREA II
0+00
EL. 12.00
13.00
S=.0005
S=.001
EL. 12.11
EL. 12.20
EL. 12.23
EL. 12.27
EL. 12.29
EL. 12.31
13.02
13.05
13.07
13.36
13.37
13.52
2+38 AT LANE
PIPE OK
3+61 ℄ CO. RD.
4+25 ℄ CO. RD.
LOWER TO GRADE
3+61
LOWER TO
GRADE
0.0
5.0
10.0
15.0
20.0
CHANNEL DESIGN
Designed SHOCKLEY
Date 10/9
Drawn SHOCKLEY 10/90
Approved by
Sheet No. 9 of 11



WATER CONTROL STRUCTURES

Designed SHOCKLEY	Date 10/90	Approved by	
Drawn SHOCKLEY	10/90	Title	
Traced		Title	
Checked		Sheet No 10 of 11	Drawing No.



TYPICAL DESIGN SECTIONS

Designed SHOCKLEY	Date 10/90	Approved by	
Drawn SHOCKLEY	10/90	Title	
Traced		Title	
Checked		Sheet No 11 of 11	Drawing No.